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Abstract

This paper aims to investigate whether friends' and peers' behavior influence and individual's entry into marriage and parenthood during the transition to adulthood of young, U.S. adults. After first studying entry into marriage and parenthood as two independent events, we then examine them as interrelated processes, thereby considering them as two joint outcomes of an individual's unique, underlying family-formation strategy. Using the National Longitudinal Study of Adolescent Health, we engage in a series of discrete time event history models to test whether the larger the number of friends and peers who get married (or have a child), the sooner the individual gets married (or has a child). Results show strong cross-friend effects on entry into parenthood, whereas entry into marriage is only affected by peer effects. Estimates of a multiprocess model show that cross-friend effects on entry into parenthood remain strongly significant even when we control for cross-process unobserved heterogeneity.

Keywords

Social interactions, peer effects, fertility, marriage, multiprocess, event history analysis

Introduction

The impact of interpersonal interactions and peer effects on modifying individual behavior is increasingly acknowledged. Recent studies have examined the impact of peer effects on obesity (Christakis and Fowler 2007; Fowler and Christakis 2008) smoking behavior (Mercken et al. 2009; Pollard et al. 2010), alcohol consumption (Fletcher 2011), sexual behavior (Haurin and Mott 1990; Ali and Dwyer 2010), delinquency and criminal activities (Knecht et al. 2010; Patacchini and Zenou 2011), educational achievements (Calvó-Armengol 2009), (un)employment outcomes (Topa, 2001; Cappellari and Tatsiramos 2010), happiness (Fowler and Christakis 2008) and divorce (Mcdermott et al. 2009).

Research on the impact of peer and social interaction effects on demographic behavior, however, has remained almost exclusively in the area of fertility. Diffusion and social interaction approaches (Bongaarts & Watkins 1996; Montgomery and Casterline 1996) have demonstrated that fertility decision-making is affected by not only the individual's or couple's characteristics and the socio-institutional context, but also 'relevant others' behavior (e.g., what relatives, friends, neighbors, colleagues think or do). These social interaction mechanisms have then been used to explain persistent differences in fertility trends across time and place (e.g., social multiplier effects; Kohler et al. 2002; Kohler et al. 2006).

Research examining the impact of the social interaction effects of peers and friends (sometimes also referred to as cross-peer and cross-friend effects) beyond fertility behavior has remained limited. Due to the lack of suitable data and difficulties with identifying endogenous interaction effects, quantitative research (e.g., Manski and Mayshar 2003; Lyngstad and Prskawetz 2010) has only marginally examined these questions. Research on family-formation behaviors beyond fertility is virtually absent, although the same theoretical considerations regarding the importance of social interaction could most certainly be applied to other demographic behaviors, such as marital decisions.

In the current study, we aim to extend existing research on social interaction effects by investigating to what extent friends' and peers' behavior can influence the entry into marriage and parenthood during the transition to adulthood. In the demographic and sociological literature, entry into marriage and parenthood have been established as closely interrelated events, both in terms of their timing (Rindfuss et al. 1988; Manning 1995; Mills and Blossfeld 2005) and the life planning they imply (Liefbroer 1999; Barber et al. 2002). Some studies have specifically addressed the issue of spuriousness of the relationship between these two processes (Lillard 1993; Upchurch et al. 2002; Baizan et al. 2003; Baizan et al. 2004; Steele et al. 2005; Steele et al. 2006). In an attempt to uncover the causal nature of the relationship between marital and fertility decision-making, this body of research has highlighted how inter-individual differences in subjective dimensions might affect both demographic processes.

Building upon and extending previous research, we introduce two main contributions to the field. First, we investigate how social interaction might differently impact entry into marriage and parenthood. So far, diffusion and social interaction studies have almost exclusively focused on fertility only. We extend existing literature examining friends' and peers' effects on two different family-formation behaviors (i.e., marriage and childbearing). Our second contribution is a theoretical and empirical extension of the social interaction and diffusion literature on marriage and family formation. We not only consider entry into marriage and parenthood as two independent transitions, but also as two joint outcomes of an individual's unique, underlying family-formation strategy. Our aim is then to uncover whether cross-friend interactions affect the interrelated decisions of getting married and having a child. In this way, we provide a unique contribution to the existing research, which until now has only investigated the effect of social interaction on isolated life-course

outcomes (mostly fertility choices, such as cross-sibling effects on fertility, Lyngstad and Prskawetz 2010).

The central research questions that this paper aims to answer are therefore: *Do cross-friend interactions affect both the entry into marriage and parenthood or do they only influence one of the two processes? Is there a difference in the susceptibility to the influence of friends versus peers between marriage and fertility processes? To what extent are the peer effects on fertility found in previous studies affected by the presence of common unobserved heterogeneity?*

Our study focuses on the study of young adults in the American context, following them from age 15 until around 30 years. The transition to adulthood in the U.S. is particularly interesting to investigate, since there have been substantial changes in family formation behaviors in recent years (Ryan et al. 2009). Whereas in 1970 the median age at first marriage for women was 20.8 and first birth was 21.4, in 2008 they reached 25.9 and 25 (CDC/NCHS, National Vital Statistics System; Current Population Survey, U.S. Census Bureau). It is therefore relevant to uncover whether peer effects shape an individual's marital and childbearing decisions to determine whether social interactions might also play a relevant role in these macro-level, postponement trends. Young adults are moreover an ideal group for studying cross-friend effects since research shows that peer social networks have a particularly strong influence on an individual's behaviors during early adulthood (e.g., Christakis and Fowler 2007; Pollard et al. 2010; Knecht et al. 2010; Ali and Dwyer 2010). We draw on the National Longitudinal Study of Adolescent Health (Add Health) and focus on women only due to data limitations.

Background

There is a growing acknowledgment of the importance of the social network for an individual's behavior. Previous empirical applications within demography have examined the impact of social influenced and learning on contraceptive and reproductive choices in developing countries (Kohler et al. 2001; Behrman et al. 2002). Although additional empirical research has recently emerged, it remains limited due to the lack of suitable network data and the complexity of the analysis required to identify social interaction effects and disentangle them from confounding effects. Until now, next to the qualitative work of Bernardi and colleagues (e.g., Bernardi 2003; Bernardi et al. 2007; Keim et al. 2009), which has provided relevant insights into how social influence and learning operate to impact fertility choices in advanced societies, several recent studies adopt a quantitative approach to examine fertility outcomes. They empirically demonstrate that social interactions among siblings (Kuziemko 2006; Lyngstad and Prskawetz 2010), co-workers (Hensvik and Nilsson 2010; Ciliberto et al. 2010), friends (Balbo and Barban, 2012) and peers belonging to the same ethnic-religious group (Manski and Mayshar 2003) shape an individual's fertility decisions.

Although it is plausible that social interactions affect demographic behavior beyond fertility, research is limited. To our knowledge, only a handful of studies examine peer effects on union formation. Hernes (1972) developed a macro-level diffusion model of age at marriage, showing that the greater the share of married peers within a cohort, the higher the propensity to marry for individuals in such a cohort. Whereas Hernes assumes that members of the same cohort constitute the influential peer group, Drewianka (1999, 2003) instead identifies people living in the same geographical area (i.e., county) as the relevant peer group. Here the assumption is that an increase in the fraction of single persons aged 16-44 in a certain geographical area leads to a decrease in the propensity to marry for an individual living in that area. In a similar way, Nazio and Blossfeld (2003) used diffusion models to

examine the spread of cohabitation in Germany and Italy. They find that the adoption of cohabitation across different generations is not driven by intergenerational experiences or the increase in cumulative proportions across cohorts, but rather by the social modeling of peers.

An alternative approach is the use of agent-based models and simulated data to examine how social interdependencies shape respectively marital and fertility decisions (Billari et al. 2007; Aparicio Diaz et al. 2011). Although these simulations have the undeniable shortcoming that they *a priori* assume peer effect influences at the micro level, they offer the ability to assess to what extent macro dynamics in demographic behavior can be explained by social interaction at the individual level. Aparicio Diaz et al. (2012), for instance, find that accounting for social interactions in a agent-based model, can explain the shift in fertility rate observed in Austria between 1984 and 2004.

Theoretical Framework

To understand how cross-friend interactions and peers might influence family formation, we can draw on two bodies of literature. The sociological and demographic literature has identified the two processes of social learning and social influence, with the economic literature offering the additional mechanisms of cost-sharing dynamics and network externalities.

Social learning and social influence. An individual's life course decision-making is not only driven by his or her own personal characteristics and institutional factors, but also by the characteristics and the behavior of people whom that individual interacts with (Bongaarts and Watkins 1996; Montgomery and Casterline 1996; Kohler 2001; Bernardi 2003). A body of research in demography has identified two processes through which relevant others (e.g., relatives, friends, colleagues) matter for fertility choices: *social influence* and *social learning* (e.g., Montgomery and Casterline 1996; Kohler et al. 2001). Social influence references to

consensus in peer groups that constrains attitudes and behaviors, whereas social learning relates to how individuals gain knowledge from others.

Cost-sharing dynamics and network externalities. Economic research identifies two other possible, complementary channels via which social interaction might work: cost-sharing dynamics and network externalities (Kuziemko 2006; Balbo and Barban 2012). Cost-sharing dynamics refer to the opportunity for people consuming the same kind of good or experience to share costs and uncertainty associated with it. Network externalities are instead defined as an increase in the benefit, or surplus, that an individual derives from an experience when the number of other people consuming it increases (Katz and Shapiro 1985). These two mechanisms emphasize two different aspects of the same sharing process: while the former focuses on the cost side, the latter stresses the benefit side.

We expect that friends might influence an individual's risk of both getting married and becoming a parent, although we believe that the main mechanisms via which such an influence occurs are different for the two life transitions. These two events indeed bring about different levels of costs and lifestyle changes, with entry into parenthood having deeper implications than marriage.

Entry into marriage. In contemporary U.S. society, marriage has become less normative and widespread than in the past (Manning and Smock 1995; Uecker and Stokes 2008; Cherlin 2005). At the same time, cohabitation has been increasing (Kennedy and Bumpass 2008; Smock et al. 2008; Ryan et al. 2009), becoming the modal path to marriage (Huang et al. 2011). Young people largely view cohabitation as a pre-marital stage, not as a substitute for marriage (Manning et al. 2007). In this study, we examine only marriage and not cohabitation for both substantive and practical reasons. The primary reason is that it is less theoretically plausible that friends and peers influence the entry into cohabitation as opposed to marriage. Although cohabitation is increasingly widespread (Kennedy and Bumpass 2008), it still lacks

the strong symbolic meaning attached to marriage. Cohabitation decisions have been shown to be driven by practical reasons (e.g., to reduce living costs), with individuals often ‘sliding’ into cohabitation in a more diffuse manner (Stanely et al. 2006). For practical reasons as well, cohabitation is not included in this study. Since cohabitation and marriage are not mutually exclusive, it is not possible to identify the specific cross-friend influence on the different family formation patterns.

Assuming that a large part of young adults get married after already co-residing with their partner, or having experienced cohabitation with a former partner, the transition to marriage should not bring about a high degree of uncertainty, costs or considerable life changes. Therefore we do not expect that cross-friend effects primarily work via cost-sharing strategies or learning processes. Rather, people may be positively influenced by their friends who get married mainly because of the network externalities that can be generated and social influence mechanisms that lead people to conform to their friends (Nazio and Blossfeld 2003). Network externalities might for example consist of the opportunity to share the joy of the wedding experience or to ‘consume’ together the first steps of the new married life. Social influence, instead, might work via social comparison and social norms. According to the theory of social comparison (Festinger 1954), individuals adapt their behavior to those who are deemed as being in a similar social position or who share similar characteristics. Since people tend to homophily in that they bond with similar others (McPherson et al. 2001), they are likely to conform to the behavior of their friends. In this way, friends define normative conduct, or, in Cialdini’s and colleagues’ (1990) words, certain descriptive norms, which is ‘what is typical or normal, thus, what most people do’, and consequently what becomes ‘sensible to do’.

Building on this, we expect that *the higher the number of friends who are married, the greater an individual’s risk of entry into marriage (H1)*.

Entry into parenthood. Cross-friend effects on fertility likely operate mainly via social learning mechanisms and cost-sharing dynamics (Balbo and Barban 2012). Compared to getting married, having a child brings about more uncertainty and costs (monetary ones, such as foregone earnings, opportunity costs in terms of a professional career, as well as non-monetary ones, such as relational costs) (Mills et al. 2011). We assume that having friends with children, with whom an individual can share his or her experience as a parent, might reduce the uncertainty associated with it because friends can offer behavioral examples and provide relevant information on how to face the transition to parenthood and deal with the substantial life changes it brings about (Bernardi 2003). Moreover, going through such a unique life transition as the only person within a peer group likely leads to higher relational costs. Becoming a parent is a radical change in one's life, that strongly impacts the amount and the nature of leisure time, and thereby the time spent with friends. Therefore, having the opportunity of experiencing parenthood together with (or right after) other friends make this transition less relationally costly, because life changes within a social group are synchronized (or anyway shared) and the risk of being left alone or lagged behind is reduced. Based on this, we pose the following hypothesis: *the higher the number of friends who have a child, the greater an individual's risk of becoming a parent (H2).*

Simultaneous influences on entry into marriage and parenthood. As multiple studies have shown, young adults continue to see a stable union as the optimal and appropriate setting for having a child (Manning and Smock 1995; Hobcraft and Kiernan 1995; Kiernan 1999; Smock and Greenland 2010; Thomson et al. 2012). Entry into parenthood is much higher in a co-residential partnership, and especially marriage, compared to singlehood (Baizan et al. 2004). However, a body of research has highlighted that this association might be spurious and therefore the sequence of events (e.g., first partnership and then parenthood) might not reflect a causal relationship. If living together with a partner increases the risk of having a child, the

willingness of becoming a parent might accelerate the decision to form a union (Brien et al. 1999; Baizan et al. 2003; Baizan et al. 2004). Put differently, there might be some common unobserved subjective factors that simultaneously affect both family-formation decisions (Aassve et al. 2006).

For this reason we therefore consider entry into marriage and parenthood as two joint outcomes of an individual's unique, underlying family-formation strategy. This strategy is influenced not only by unobserved personal family predispositions and attitudes but also by unmeasured social norms, influence and pressure which an individual is exposed to within her social network. We envision these unobserved forces to influence both marital and parental decisions in a concordant way (e.g., either positively or negatively impacting both processes), leading people to choose consistent family formation paths over their life-course. In line with this argumentation, we therefore expect that *the risk of entry into marriage and having a first child might be partially determined by common individual factors, which are positively correlated (H3)*.

Our ultimate goal is to uncover whether cross-friend effects on fertility, which have been found in previous research, are actually at play even when we take into account possible preceding cross-friend influence on the transition to marriage and control for common inter-individual heterogeneity affecting both marital and fertility decisions. For this reason, we focus on a conventional demographic pathway in which an individual first experiences marriage, followed by parenthood.

It is very difficult to theoretically argue and *a priori* anticipate how cross-friend effects on fertility might be affected by these factors, the presence of which needs to be determined in the first place. It may for instance be that most of the cross-friend influences occur via marriage, with individuals positively affected by friends who get married, thereby entering into matrimony themselves. Cross-friend effects on an individual's risk of having a child

might therefore simply be the consequence or side-effect of the influence of a previous marriage by a friend. If this is the case, once marriage and childbearing are investigated as joint decisions, the friend effect on childbearing might be lower or negligible. We opted to engage in an exploratory analysis without postulating any specific hypothesis, in line with the approach adopted by Steele and colleagues (2005).

Data and method

Data and sample

The data we use come from all of the four waves of the National Longitudinal Study of Adolescent Health (Add Health), a panel study of a nationally representative sample of adolescents in the United States, who were in grades 7-12 in Wave I (1995). The Add Health cohort (born between 1976 and 1982) has been followed into young adulthood with four in-home interviews (Wave I in 1995, Wave II in 1996, Wave III in 2001-2 and Wave IV in 2008-9), at the end of which the sample was between 24 and 32 years old. Add Health provides us with the unique opportunity to make use and combine three different types of information: longitudinal data on respondents' socio-economic, psychological and physical characteristics, information on their life course events and trajectories, and data on the social context and networks (e.g., family, neighborhood, community, school, friendships, peer groups). Therefore, these data optimally serve our purpose of investigating the impact of social interaction among friends on the transition to marriage and parenthood.

We restrict our sample to women only, not younger than 15 years old, who are observed until around age 30. The decision to exclude men from our analysis rests with substantial data limitations. As already documented by Schoen et al. (2007) and Amato et al. (2008), there is a systematic misreporting of childbirths in the fertility history modules (refer to the mentioned studies for further details). This underreporting of male fertility has also been found in other

large surveys (e.g., Joyner et al. 2012). However, while we could make use of the information in the household roster to adjust omitted fertility data for women (we followed the same procedure described by Schoen et al. in their paper, 2007: 810), this was not possible for men. Thereby, men were excluded from the study sample.

In Wave I, in-home and in-school questionnaires were administered to 20,745 respondents. In the latter questionnaire, in-school network information was collected and up to 10 friendship ties for each respondent were identified. In Wave III, a follow-up of the Wave I network module (from now on called *friends module*) was administered to 3,572 respondents, who were in 7th and 8th grade at Wave I. Since we included only women in our study, our final sample consists of 1,903 individuals. Because we also make use of information collected in Wave IV, women who dropped out after Wave III (N=177) are part of our sample but are considered as right censored after Wave III. In the *friends module* of Wave III, respondents were asked a battery of questions about the current relationship (or lack thereof) with 10 former school mates. These 10 people were selected into a respondent's questionnaire by a name generator based on the probability of remaining friends with that respondent¹. Every selected school mate was also a respondent in the previous Waves, as well as in the in-home survey at Wave III. Among the 10 former school mates of each respondent, we excluded men (for the same reason why we only included women in our sample, see above), and those who were identified as kin (e.g., cousins, siblings), in order to specifically focus on former school mate who were not part of the family network. Using information on friendship status at Wave III, we defined two categories of the network relationship: *peers* (i.e., former school mates who have never been friends) and *friends* (i.e., former school mates who became friends during high school and have remained so over time). Former friends who

¹ Probable friends were chosen based on two types of information: the attributes' similarity between ego and alter (i.e., the former school mate) and the relative network position of ego and alter. The predicted probability of being friends is based on a dyad-level logistic regression. For further details, refer to Balbo and Barban (2012).

used to be respondent's friends but were not any more at Wave III were excluded from the respondent's list of 10 former school mates. This was done due to the lack of reliable information on the length of friendship, which would not allow us to analyze the pattern of influence of former friends. The friendship network we could draw for each respondent using the *friends module* of Wave III represents only a partial view of an individual's entire friendship network. However, we assume that the partial network of friends from high school is a representative selection of an individual's entire friendship network during early adulthood, which has been shown by previous longitudinal studies (e.g., Chang et al. 2010).

Since we focus on individuals who first experienced marriage and then parenthood, we want to avoid any reverse causation of childbirth on marriage. We therefore censored individuals one month after the conception of their first child, thereby taking into account only transitions to marriage that occur before entry into parenthood. We extended the period of observation to one month after the time of conception because if marriage takes place within the same month in which a child is conceived, it is likely not the direct result of the pregnancy. If an individual does not experience the transition to parenthood, she is censored at the time of the last interview.

In our sample, each respondent has on average 3.5 peers and 0.8 friends. During the exposure time under examination, 713 respondents got married and 842 became parents. The median age at first marriage is 28, while the age at conception is 26.7.

In this study, we only focus on first marriage as well as first child for two main reasons. First, respondents are relatively young at Wave IV, and therefore subsequent marriages and childbirths are rare events in our data (e.g., only 22.5% of our sample experiences higher parity before Wave IV). Secondly because, by looking at recurrent episodes for each individual we would encounter what is defined as 'reflection' issues in the econometric literature (Manski, 1993). This refers to the difficulty in disentangling whether a friend's

behavior is the cause or just the reflection of the individual's behavior. By only looking at first marriage and first birth, however, this problem does not seem to affect our analysis. By exploiting the panel design we have, we can assume that if the marital or fertility event of friends occurs before the one of the individual in question, the former can only be the cause of the latter, and not the reflection of something that has not yet happened. We decided to focus on marriage only and not on cohabitation as well for several reasons. Since we are interested in the unobserved factors affecting union formation as well as first parenthood, it is more meaningful to look at the union episode in which the entry into parenthood is more likely to occur. While the link between first marriage and first birth is strong, being the first marriage the preferred setting to have the first child, this is not necessarily true for first cohabitation. Multiple cohabitation experiences are common before childbearing, but we are not able to take them into account because we do not consider recurrent events. Moreover, marriage and cohabitation are not mutually exclusive. The majority of married couples in US experienced cohabitation before marriage and cohabiting friends can influence both the respondent's decision of cohabiting, as well as the decisions of marrying. This would lead us to analyze cohabitation and marriage as competing processes, making it very difficult to study the pattern of influence of friends on an individual's family formation behavior. To overcome this limitation, we engage in a robustness check, in which we repeat our analysis in a selected group where cohabitation is less common and childbearing outside marriage is very rare. Using the respondents from religious family (attending religious services at least once a week), we investigate if we observe the same causal mechanisms in peers and friends influence on family formation and fertility decisions.

Analytical strategy

To answer our research questions and test our hypotheses, we developed an analytical strategy to tackle two main issues: (i) identification of cross-friend effects, disentangling them from contextual and selection effects; (ii) study of entry into first marriage and parenthood not only as two independent events, but also as interrelated processes, simultaneously affected by common unobserved individual factors (i.e., controlling for common unobserved heterogeneity). In this section, we describe how we address these two issues, focusing on them one-by-one.

Strategy to identify interaction effects

To empirically test whether friends' behaviors have a positive influence on an individual's risk of getting married and becoming a parent, contextual and selection effects have to be taken into account. The fact that friends act in a similar way might not necessarily be attributed (only) to cross-friend influence. Rather, two other mechanisms might operate as confounders. On the one hand, similarities in friends' behavior might be the result of the fact that friends live (and sometimes even choose to live) within the same social setting and are exposed to the same contextual forces and factors (Feld 1981; 1982). On the other hand, since people tend to bond with individuals who are alike, similar behaviors might be the cause, and not the consequence of preceding similar characteristics among friends (i.e., homophily, Lazarsfeld and Merton 1954; McPherson et al. 2001). Building upon the strategy developed by Balbo and Barban (2012), to disentangle confounding contextual effects from true cross-friend influence, we exploited the Add Health survey design and in particular information on the network structure from the *friends module* at Wave III. Similarly to the strategy used by Elwert and Christakis (2008), who disentangle causation from shared-exposure bias in the 'widowhood effect' between spouses by examining both wives and ex-wives, we identified

and distinguished between two different categories of an individual's former school mates: friends and peers. We considered as friends those who were identified as current friends by the respondent at Wave III. We defined peers as those who were just former school mates of the respondent but have never been friends. By including and estimating both types of ties in our analysis, we could distinguish between the effect of the shared social context (operationalized by peer effect) from the cross-friend interaction effect.

By virtue of the survey design, selection is less of an issue in our analysis. We simply assumed friendship to be exogenous to the family-formation decision-making (i.e., both marital as well as fertility decisions). Friendships and peer relationships under study were formed at the latest when respondents were around 12-15 years old (Wave I); therefore we could assume that their formation is exogenous to the decision to marry or become a parent. Put differently, the decision to become a friend with someone is antecedent, and therefore independent from marital and childbearing choices. It is highly unlikely that a 12 years old adolescent chooses friends based on their family attitudes and orientations.

Marriage and parenthood as two independent transitions

In our analysis, we first look at marriage and childbearing as two separate and independent life transitions. Only in a further step we use a modeling strategy that simultaneously estimates entry into marriage and parenthood as dependent processes (see next sub-section).

We created an individual-month file, and, in order to be able to have the risk of marriage and parenthood as dependent variables, we computed two dummy variables that take on value 1 in the month within which the individual i gets married or conceive (measured by subtracting 9 months from the time of delivery) and 0 in the preceding months for each respondent.

The two hazards of getting married and conceiving the first child during month t for individual i are estimated using two separate *cloglog* discrete time hazard functions. The hazard functions for the probability that the respondent i gets married or pregnant at time t are represented by h_i^m and h_i^c respectively, where:

$$(1) \quad \begin{aligned} \log[-\log(1-h_i^m(t))] &= \alpha D_i(t) + \beta_1 X_i + \beta_2 F_i^m(t) + \beta_3 P_i^m(t) + \varepsilon_i \\ \log[-\log(1-h_i^c(t))] &= \alpha D_i(t) + \beta_1 X_i + \beta_2 M_i^c(t) + \beta_3 F_i^c(t) + \beta_4 P_i^c(t) + \delta_i \end{aligned}$$

$D_i(t)$ is the baseline hazard, which in our case is a quadratic function at time t of the individual i 's duration (in age) between entry into the risk set (age 15) and the event under study (marriage or childbirth): $\alpha D_i(t) = \alpha_0 + \alpha_1(\text{age}_i) + \alpha_2(\text{age}_i)^2$. X_i represents a set of observed time-constant variables measuring individual i 's observable characteristics that affect i 's transition to marriage and first birth. $M_i^c(t)$, which is only present in the childbearing equation, is a time-varying covariate identifying whether and when individual i is married. It takes on a value of 1 in the months in which the individual i is married, and 0 otherwise. $F_i^m(t)$ and $P_i^m(t)$ are two additional time-varying variables indicating respectively how many friends or peers get married over time. $F_i^c(t)$ and $P_i^c(t)$ instead represent the time-varying variables measuring how many friends and peers become parents. In order to better capture cross-friend influence on fertility, we consider the birth of the friend's child, not the time of conception. However, we also tested whether the event was backdated up to 6 months at the start of the cross-friend influence, and did not find any substantial change in the estimates. For the sake of simplicity and to address multicollinearity issues, we assume that friends' marriage behavior only impacts an individual's risk of getting married (and not the

one of becoming a parent), and vice versa, that an individual's risk of having the first child is only affected by friends' fertility outcomes (and not by friends' marital outcomes).

To measure cross-friend effects, we drew upon the so-called Susceptible-Infected-Susceptible (SIS) model (e.g., Pastor-Satorrás and Vespignani, 2001), used widely in epidemiological studies. As in the SIS model, we assumed the contagion to be linear on the absolute number of “infected” (i.e., married or parents) friends. This means that the probability for the individual i of “being infected” only depends on the number of “infected” friends but not on the total number of friends the individual i has.

ε_i and δ_i represent the unobserved time-invariant individual-specific factors respectively influencing the risk of getting married and the one of having the first child. They are normally distributed random effects, with a zero mean and variance constrained to 1. We had to fix the variance of the two process-specific random effects (ε_i and δ_i) because we did not have repeated events for each individual i , that could bring enough intra-individual variation and therefore allow a proper identification of the random variables' variance. We engaged in a sensitivity analysis of the estimates to assess the most appropriate values of the variance of these random effects. While the size of the covariates' effects was affected by changes in the variance's chosen value, the direction and the significance were very much consistent over our experiments. In line with Baizan et al. (2003, 2004), we adopted a value of 1 for both variances of the two random effects.

Entry into marriage and parenthood as two interrelated processes: a multiprocess model

Until now, we have assumed entry into first marriage and entry into parenthood as two independent transitions, thereby constraining the correlation between the random variables of the two hazard functions to be zero. In order to estimate the two processes simultaneously

and, thereby taking into account cross-process unobserved heterogeneity at the individual level, we engaged in a multiprocess system (Eq. 2):

$$(2) \quad \begin{cases} \log[-\log(1-h_i^m(t))] = \alpha D_i(t) + \beta_1 X_i + \beta_2 F_i^m(t) + \beta_3 P_i^m(t) + \varepsilon_i \\ \log[-\log(1-h_i^c(t))] = \alpha D_i(t) + \beta_1 X_i + \beta_2 M_i^c(t) + \beta_3 F_i^c(t) + \beta_4 P_i^c(t) + \delta_i \end{cases}$$

in which the two random variables ε_i and δ_i are assumed to have a joint bivariate normal distribution:

$$(3) \quad \begin{pmatrix} \varepsilon \\ \delta \end{pmatrix} \sim N \left(\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} 1 & \rho_{\varepsilon\delta} \\ \rho_{\varepsilon\delta} & 1 \end{pmatrix} \right)$$

$\rho_{\varepsilon\delta}$ is the correlation between the unobserved heterogeneity terms of the two equations in the system (Eq. 2). We implemented the model using the software *MLwiN 2.24*, which performed the estimation using restricted maximum likelihood (RIGLS algorithm, Rasbash et al. 2004).

Following Lillard et al. (1995), Upchurch et al. (2002) and Steele et al. (2005), our multiprocess model is identified under the assumption that every source of correlation among the two processes under study are fully represented by cross-process correlation between individual-level residuals. Although we did not engage in a recurrent event model, by fixing the values of the variance of the two random variables ε_i and δ_i , our model could be identified without using any exclusion restriction. This model only includes the effect of previous marital outcomes on the fertility hazard, but does not include any structural effect of the hazard of having a child on the hazard of marriage transition. However, although not strictly necessary, our two equations do include covariates that specifically affect only one process (i.e., event-specific cross-friend effects). Moreover, following once again Baizan et al. (2004), we also experimented with including the control variable measuring the number of

siblings only in the fertility hazard and not in the hazard of marriage, but results did not change.

Covariates and control variables

In addition to controlling for unobserved time-invariant individual factors (by means of estimating random effects) and therefore preventing possible selection effects over time, we also included observable time-invariant as well as time-varying variables. We identified some factors that might confound cross-friend interaction effects on the risk of getting married and having a first child. Specifically, we controlled for relevant socio-demographic individual characteristics (measured at Wave I), namely, race, parental education, income, religiosity and family type. For race, we distinguished between Black and non-Black (in preliminary analyses we also looked at Hispanics as a separate category, but since it was a small group and not significantly different from Whites, we merged Whites and Hispanics into one, unique category). Parental education is identified using a dummy variable indicating when at least one parent have at least college education; parental income is measured using quintiles; parental religiosity is expressed by a dummy variable that takes on value 1 when parents state that they have gone to religious services at least once a week in the past year. Finally, family type is measured using a dummy variable which takes the value of 1 in the case of an intact family (i.e., child is residing with both alive parents at Wave 1) and 0 in the case of a single-parent family or step-family.

We also took into account the number of current friends at Wave III as a proxy of an individual's friendship network's size, which might affect her social life and in turn her family formation strategy. Moreover, besides including age as a measure of the baseline time profile, that we assumed to be quadratic, we also included marital status as a time-varying covariate in the childbearing equation.

Results

Descriptive results

Descriptive results provide initial interesting insights into which individual characteristics are associated respectively with the transition to marriage and parenthood among young adults.

Table 1 reports descriptive statistics of the entire sample (last column), which we first investigated by dividing it into two sub-samples of women who experienced their first marriage within the observation period and women that remained unmarried by Wave IV ('marriage' columns in Table 1). We followed the same procedure for parenthood, identifying the two groups of parents and non-parents during the observation window ('childbearing' columns of Table 1). The four groups differ in compositional characteristics. We are specifically interested in uncovering the main characteristics associated with respectively entry into marriage and parenthood by the age of 30 and how compositionally similar (or different) the two groups of wives and mothers are.

>> INSERT TABLE 1 ROUGHLY HERE<<

Examining first the bottom part of Table 1, we see that within our sample the majority (63.5%) of women who get married also become mothers before the end of our period of observation. In the same way, 53.8% of women who become mothers by the age of 30 are married. Among the share of unmarried mothers, there are of course both single mothers as well as cohabiting women. As we expected therefore, at the descriptive level we find a positive association between marriage and childbearing.

In line with the most recent U.S. official statistics (CDC/NCHS, National Vital Statistics System; Current Population Survey, U.S. Census Bureau), the median age at the conception of the first child, which is 26.67, is smaller than the median age at first marriage (28.08).

Compared to those who have not had children, young mothers are more likely to come from a low socioeconomic status, measured in terms of parental education and family income at Wave I. Moreover, they are less likely to grow up in a family with both biological parents and they have, on average, more siblings. Although these patterns are slightly traceable in the comparison between (still) single and married women as well, they are much less pronounced. Therefore, a low socio-economic status is more likely to be associated with early motherhood than early marriage. Young adults coming from a religious family background are conversely slightly more likely to marry early as opposed to becoming young mothers. However, the main difference between the groups of ‘wives’ and ‘mothers’ rests with race. The percentage of Blacks among early mothers is higher than women with no children, but it is definitely lower among married than singles. We do not observe substantial differences across groups in the number of friends at Wave III; each group has an average number of friends of around 0.8 and an average number of peers of around 3.5. Therefore, these results do not provide evidence of substantial differences in the number of network relationships across groups.

Results of the two independent hazard models for marriage and parenthood

Estimates of the two independent hazard models for the risk of getting married and becoming a parent are shown in Table 2. Net of the baseline hazard and the control variables’ effect, we find no cross-friend influences on an individual’s risk of getting married. Specifically, an increasing number of friends who enter matrimony does not raise an individual’s risk to marry. We do, however, find a significant contextual effect, evident from the positive effect

on that risk of an increasing number of peers (i.e. non-friends, former school mates) who get married. Therefore, our first hypothesis does not seem to be supported by the data. On the other hand, the fact that former school mates influence an individual's propensity to marry is very much in line with Hernes (1972) findings, showing that the greater the shared of married peers within a cohort, the higher the risk of getting married for individuals in such a cohort. He specifically argues that people are affected by social pressure exerted by peers of around the same age (like in our case, since we define as an individual's peers as her former school mates), because social interaction is assumed to be age-graded. Of course, besides social pressure, other confounding contextual forces might be at play, such as a pure aging effect, or the simple fact that former school mates come from the same geographical area or same socio-economic status, which might shape each individual's propensity to marry at the same time.

>> INSERT TABLE 2 ROUGHLY HERE<<

Going back to Table 2, we can see that our findings support our second hypothesis, since results of the hazard model for fertility show that an individual is more at risk of becoming a mother when the number of friends who are parents increases. This finding is in line with previous studies that find evidence of social interaction effects on fertility decision-making, looking at siblings (Kuziemko 2006; Lyngstad and Prskawetz 2010), co-workers (Hensvik and Nilsson 2010; Ciliberto et al. 2010), and dyads of friends (Balbo and Barban 2012). No contextual effects are found on the propensity to have the first child. Different from marriage, peers' behavior does not seem to be associated with an individual's fertility decision.

While marital choices seem to be affected by contextual factors, and maybe a general social pressure stemming from the fact that coetaneous people start to get married more and

more, the decision to become a parent is clearly more influenced by friends' behavior. This difference might rest with the fact that the latter choice brings about much more uncertainty as well as higher costs. Life changes associated with transition to parenthood might be better borne and faced if they are shared with friends, which can be a great source of information. Synchronizing such a transition with friends, moreover, can be a good strategy to reduce relational costs, by minimizing the risk of being left alone.

Let us now turn to the baseline hazard and the effect of our control variables on the risk of marrying and becoming a parent. The duration pattern, as a quadratic function of an individual's age, shows a clear curvilinear shape for both family-formation behaviors. The positive effect of older age on marriage and first birth rate is coupled with a small negative effect of age squared indicating that the effect of an individuals' age becomes weaker or negative, the older the individual is. We observe an interesting, substantial difference in how race influences the two risks of getting married and having a child. While Black women are more likely to become mothers earlier than non-Black ones, it is the opposite for the risk of getting married, with non-Black women more likely to experience an early marriage than Blacks, in line with previous research (Edin and Reed 2005). We also find that the higher the number of siblings, the younger the age at first birth, also confirming previous results (e.g., Rijken and Liefbroer, 2009). No similar effect is found for the marital decision.

Turning to the economic situation of the family of origin, we observe that women from low-income families have a higher risk of becoming parents sooner than those from a higher income family. This effect on the propensity to marry is not as clear-cut. Specifically, only people coming from a very disadvantaged family, that is, with a very low income, have a higher risk of getting married. This finding is in line with previous research (Uecker and Stokes 2008). As far as parental education and family type are concerned, we find that they only shape the risk of becoming a parent, and not marriage. People who have more educated

parents seem to have the first child later than those who come from a less educated family. Presumably, this effect is the result of the fact that the first group of individuals is more likely to stay in education longer, thereby delaying the entry into parenthood (Rijken and Liefbroer 2009). Individuals who grew up with both biological parents become parents later than those who resided in a step or single parent family. On the other hand, parental religiosity only affects the risk of getting married. As expected and in line with existing research (Thornton et al. 1992), a religious family background increases the propensity to marry earlier. Finally, the positive close link between marital and childbearing decisions is evident from the fact that married women have a much higher risk of becoming mothers. Whether this effect captures only a causal relationship between the two decisions (from marriage to childbearing), or is the result of a spurious association, cannot be concluded using the model shown in Table 2. We therefore apply a multiprocess model to overcome this issue, controlling for possible unobserved heterogeneity common to the two processes.

Results of the multiprocess model

Table 3 and Table 4 report the respective estimates of the fixed and the random part of the multilevel process we estimated to take into account possible unobserved heterogeneity at the individual level affecting both processes, that is, the risk of entry into marriage and parenthood.

If we compare the estimates of the covariates' coefficients of the multiprocess model (Table 3) with those of the two independent models, we cannot find substantial differences in both processes. The effect of the control variables and the baseline hazard is consistent, although low parental income seems to have a slightly stronger impact on the propensity to marry in the multiprocess model. The only relevant, but expected change is in the effect of marital status on the risk of having a child. Table 4 shows a strong, positive correlation

between the random effects of the two hazards, fully supporting our third hypotheses that the risk of entry into marriage and parenthood is partially determined by common individual factors, also found in previous studies (e.g., Baizan et al. 2003; 2004; Aassve et al. 2006). As a consequence of the presence of a significant and rather high common unobserved heterogeneity (i.e., there are time-invariant subjective factors that affect both an individual's propensity to marry as well as the one to become a mother. Table 4), the direct and independent effect of marital status on the risk of first birth is reduced, although it remains strong and highly significant (Table 3). This suggests that marriage, net of common unmeasured individual family predispositions, has its own independent effect on childbearing, being perceived by a woman as the most appropriate setting to become a mother.

>> INSERT TABLE 3 AND 4 ROUGHLY HERE<<

Our finding that the correlation between the unobserved heterogeneity of the two hazards is strong and positive indicates that transition to marriage and transition to parenthood can be considered as joint choices of a couple's unique underlying family-formation strategy. The presence of this positive correlation between these two decisions moreover suggests that those women who marry early likely become early mothers as well.

As outlined previously in our theoretical section, it appears that different mechanisms regulate the impact of social interactions on marriage versus fertility. Since peers have a stronger impact on marriage, one conclusion is that the social influence or pressure of seeing people around oneself entering into marriage is the central theoretical mechanism that regulates entry into marriage. Entry into parenthood, on the other hand, appears to be more influenced not by broader peer, but rather more immediate cross-friend effects. This is attributed not only to social learning and seeing how friends experience parenthood, but also

the advantages of cost-sharing dynamics such as childcare. Previous studies have found that both social pressure, but also the perceived availability of childcare help and emotional support within one's social network results in higher fertility intentions for second and third births (Balbo and Mills 2011). It may be that network externalities also play a role in fertility since individuals may derive a benefit of 'pooling' parental resources (e.g., joint childcare, co-driving children to activities) when more friends around them also increase their own 'consumption' (i.e., fertility).

Robustness check: the role of family religiosity

Some have claimed that the cultural shift towards individualization (Beck and Beck-Gernsheim 2001; Uecker and Stockes 2008), has led individuals to be less susceptible to social norms (Bumpass 1990; Lesthaeghe and Surkyn 1988). As Thornton and colleagues have argued (1992), however, certain groups may be more susceptible to social influences. People who come from religious families are likely to grow up in a religious environment that places a higher value of marriage, encourages early marriage and attaches social recognition to it. To test the robustness of the previous models, we repeat the previous analysis focusing only on a subsample of respondents from religious family, i.e., those who at Wave I had parents attending religious services at least once at week. This selected group has two main characteristics that can be used to test the robustness of the previous findings. First, people with religious background are more likely to follow a traditional family formation pattern. Cohabitation is less diffuse among people with higher religiosity and childbearing happens almost exclusively within marriage. Women with religious family are more likely to marry in the observation period. Within the religious group 39.1% got married before Wave IV, while in the non religious group those who got married are 36.5%. This group of respondents is thus more likely to be influenced by marriage and less from other family formation patterns. For

this reason, we expected that, if cross-friend influences act through marriage rather than fertility, this is particularly true for this selected group since childbearing outside marriage is less common. Second, this group also differs in the compositions of their peers and friends. Respondents from religious families are more likely to have religious friends who in turn are more likely to be married. Existing studies have shown that religiosity hastens marriage and religious people place high value and strong symbolic meaning into such a union (Thornton et al. 1992; Uecker and Stockes 2008). Women in this group have on average 0.4 friends who got married before Wave IV, while non-religious respondents have on average 0.2 friends who got married. These respondents represent a selected group in which the marriage is the normative transition before childbearing. Although this group is highly selected on family attitudes and predisposition to marriage, it represents a suitable test to investigate if cross-friend influence on childbearing are confounded by cross-friend influences on marriage formation. This group is composed by 669 women (35% of the entire sample).

The previous analyses are repeated to the selected group of women from religious families on Tables 5 and 6. Results show that peers and friend positively influence the timing of marriage. In particular, differently from the results on the entire sample, friends have a significant effect on the probability of marriage. As expected, among this selected group of respondents, the social influence of marriage within the friendship network is stronger than in the entire sample. Nevertheless, cross-friend influence on childbearing remains strongly significant event if the cross-influence acts also in the marriage behavior. This indicates that friends influence childbearing net of their influence of union formation behavior. It is also interesting to notice that the correlation on the unobserved heterogeneity of the two processes is higher than for the entire sample (see Table 6). This corroborates the hypothesis that marriage and childbearing are affected by common unobserved factors, which are particularly strong in a more selected group. Overall, these results confirm that family formation and

childbearing are influenced by friends' behavior. Our results show that the cross-friend influence on childbearing is present also when marriage is more important and normative in a group. This represents a robustness check to the previous analysis, since, for the entire sample, marriage is not the exclusive pattern of family formation and childbearing can precede marriage.

Concluding remarks

This study extended existing research on the impact of social interaction effects on demographic behavior by examining the extent to which friends' and peers' behavior influences the entry into marriage and parenthood. Using the four Waves of the Add Health survey, we first engaged in independent discrete-time event history models (*cloglog*) with random effects at the individual level to estimate the risk of entry into marriage and parenthood. In a second step, we implemented a multiprocess model (Lillard 1993; Baizan et al. 2003; 2004; Steele et al. 2005; 2006) to empirically test whether an individual's underlying marital and parenthood decision were jointly taken.

By exploiting the Add Health network design, we were able to distinguish an individual's friends from peers (i.e., former school mates not defined as friends who simply shared the same social context). This provided us with the unique opportunity to estimate both cross-friend and cross-peer effects on the hazard of entry into marriage and parenthood in addition to separate true cross-friend influences from contextual effects.

Results showed a strong and significant cross-friend effect on entry into parenthood, with no impact of friends for marriage. In fact, an increasing number of friends who get married do not seem to raise an individual's propensity to marry, unless that person comes from a religious family. This latter finding is likely related to the higher levels of social pressure and

social recognition that marriage brings in this group. To reflect upon and interpret these findings, we turn to the first contribution of this study, which was the further theoretical development of four potential theoretical mechanisms – social influence and learning, cost-sharing dynamics and network externalities – to describe how social interaction might differently impact entry into marriage and parenthood. Marriage and parenthood are associated with very different levels of uncertainty and costs. A central finding was that since peers have a stronger impact on marriage, social influence or pressure appears to be the central explanatory mechanism. For entry into parenthood, however, cross-friend effects were paramount, which was related to social learning, but also cost-sharing dynamics and the benefit of ‘pooling’ parental resources in the form of network externalities.

A second contribution was empirical in nature, which is the fact that we not only considered the entry into marriage and parenthood as two independent transitions, which is often the case in existing literature, but also modeled them as two joint outcomes of a common underlying family-formation strategy. This is in line with existing literature which has demonstrated that marital and fertility decisions are highly interdependent, since they are both simultaneously affected by common unobserved inter-individual heterogeneity (Lillard 1993; Upchurch et al. 2002; Baizan et al. 2003; 2004; Steele et al. 2005; 2006; Aassve et al. 2006). By focusing on the conventional pathway in which an individual first experiences marriage followed by parenthood, we adopted a multiprocess model to uncover a positive correlation between unobserved subjective factors that simultaneously affected the decision to marry and become a parent.

Although the current study offers new insights, we are also aware of some of its limitations. First of all, in a society where cohabitation is increasingly widespread (Smock, Casper and Wyse, 2008), the fact that we could not take this type of union into account inevitably leads to a somewhat incomplete picture of the broader family formation process

among American youth. The lack of cross-friend effects on marriage might indeed also be the result of the spread of cohabitation, which might operate as a competing event. It would be desirable for further research on social interaction to take this transition into account, which was not possible in the current study. Other minor limitations are related to some of the data constraints that we faced, such as the small sample size, the inability to carry out recurrent event models or the difficulty to find a valid exclusion restriction in our multiprocess model that could allow us to also look into the reverse path of the effect of prior childbearing on marriage. These are all aspects that we hope future research can overcome, hopefully with the use of new network-based panel data, that at the moment, with few exceptions like the Add Health study, are still lacking. In spite of the abovementioned limitations, we believe this study is a first, important step towards a more thorough knowledge of how social interaction can differently impact diverse life-course transitions. If researchers as well as policy-makers believe in the shaping force of social interaction and diffusion processes, that can also modify the results of family-policies, a more detailed knowledge of how social interaction influence different demographic events is necessary.

References

- Aassve, A., Burgess, S., Propper, C., & Dickson, M. (2006). Employment, family union and childbearing decisions in Great Britain. *Journal of the Royal Statistical Society: Series A (Statistics in Society)*, 169(4), 781-804.
- Ali, M. M., and Dwyer D. S. (2010). Estimating peer effects in sexual behavior among adolescents. *Journal of Adolescence*, 34(1), 183–190
- Amato, P., N. Landale, & Havasevich-Brooks T. (2008). Precursors of young women's family formation pathways. *Journal of Marriage and Family*, 70(5), 1271-1286.
- Aparicio Diaz, B., Fent T., Prskawetz A., & Bernardi L. (2011). Transition to Parenthood: The Role of Social Interaction and Endogenous Networks. *Demography*, 48(2), 559-579.
- Baizán, P., Aassve, A., & Billari, F. C. (2003). Cohabitation, marriage, and first birth: The interrelationship of family formation events in Spain. *European Journal of Population*, 19(2), 147-169.
- Baizán, P., Aassve, A., & Billari, F. C. (2004). The interrelations between cohabitation, marriage and first birth in Germany and Sweden. *Population and Environment*, 25(6), 531-561.
- Balbo, N. & Barban N. (2012). *Does fertility behavior spread among friends?*. Dondena Working Paper (WP Series) No. 50, Bocconi University, Italy
- Balbo, N. & Mills M. (2011). Social capital and pressure in fertility decision-making: second and third births in France, Germany and Bulgaria. *Population Studies*, 65(3), 335-351.
- Barber, J. S., Axinn, W. G. & Thornton, A. (2002). The influence of attitudes on family formation processes. In R. Lesthaeghe (Ed.), *Meaning and Choice: Value Orientations and Life Course Decisions*(pp. 45–96). The Hague/Brussels: NIDI/CBGS Publications,.
- Beck, U. & Beck-Gernsheim, E. (2002). *Individualisation: Institutionalized individualism and Its Social and Political Consequences*. London: Sage.
- Behrman, J. R., Kohler H.-P., & Watkins S. C. (2002). Social networks and changes in contraceptive use over time: Evidence from a longitudinal study in rural Kenya. *Demography*, 39(4), 713–736.
- Bernardi, L. (2003). Channels of social influences on reproduction. *Population Research and Policy Review*, 22(5-6),527–555.
- Bernardi, L., Keim S., & von der Lippe H. (2007). Social influences on fertility: a comparative mixed methods study in eastern and western Germany. *Journal of Mixed Methods Research*, 1(1), 23-47.
- Billari, F. C., Prskawetz, A., Diaz, B. A., & Fent, T. (2007). The "wedding-ring": An agent-based marriage model based on social interaction. *Demographic Research*, 17(3), 59-81.
- Bongaarts, J., & Watkins S. (1996). Social interactions and contemporary fertility transitions. *Population and Development Review*, 22(4), 639–682.
- Brien, M. J., Lillard, L. A., & Waite, L. J. (1999). Interrelated Family-Building Behaviors: Cohabitation, Marriage, and Nonmarital Conception. *Demography*, 36(4), 535-551.
- Bumpass, L. L. (1990). What's happening to the family? Interactions between demographic and institutional change. *Demography*, 27(4), 483–490.

-
- Calvó-Armengol, A., Patacchini E., & Zenou Y (2009). Peer Effects and Social Networks in Education. *Review of Economic Studies*, 76(4), 1239-1267.
- Cappellari, L. & Tatsiramos K. (2011). *Friends' network and job finding rates*. Mimeo working paper.
- Chang, E.S., Greenberger E., Chen C., Heckhausen J., & Farruggia, S.P. (2010). Nonparental Adults as Social Resources in the Transition to Adulthood. *Journal of Research on Adolescence*, 20(4), 1065–1082.
- Cherlin, A. (2005). American Marriage in the Early Twenty-First Century. *The Future of Children*, 15(2), 33–55.
- Christakis N. A., & Fowler J.H. (2007). The Spread of Obesity in a Large Social Network Over 32 Years. *New England Journal of Medicine*, 357(4), 370-379.
- Cialdini, R. B., Reno R. R., & Kallgren C. A. (1990). A focus theory of normative conduct: Recycling the concept of norms to reduce littering in public places. *Journal of Personality and Social Psychology*, 58(6), 1015-1026.
- Ciliberto, F., A. Miller, H. Nielsen, & M. Simonsen. 2010. "Playing the fertility game at work." Mimeo working paper.
- Current Population Survey, U.S. Census Bureau. <http://www.census.gov/cps/>
- Drewianka, S. (1999). *Social Effects in Marriage Markets: Theory, Existence, Magnitude and Nature*. PhD Dissertation, University of Chicago.
- Drewianka, S. (2003). Estimating Social Effects in Matching Markets: Externalities in Spousal Search. *Review of Economics and Statistics*, 85(2), 409-423.
- Edin, K. & Reed, J.M. (2005). Why Don't They Just Get Married? Barriers to Marriage among the Disadvantaged. *Future of Children*, 15(2), 117-137.
- Elwert, F., & Christakis N. A. (2008). Wives and Ex-Wives: A New Test for Homogamy Bias in the Widowhood Effect. *Demography*, 45(4), 851-873.
- Festinger, L. (1954). A Theory of Social Comparison Processes. *Human Relations*, 7(2), 117–40.
- Fletcher, J. M. (2011). Peer influences on adolescent alcohol consumption: evidence using an instrumental variables/fixed effect approach. *Journal of Population Economics*, doi: 10.1007/s00148-011-0365-9.
- Fowler, J. H., & Christakis N.A. (2008). Estimating Peer Effects on Health in Social Networks. *Journal of Health Economics*, 27(5), 1386-1391
- Fowler, J. N. & Christakis N.A. (2008). The Dynamic Spread of Happiness in a Large Social Network: Longitudinal Analysis Over 20 Years in the Framingham Heart Study. *British Medical Journal*, 337, a2338.
- Haurin, R. J., & Mott, F. L. (1990). Adolescent sexual activity in the family context: The impact of older siblings. *Demography*, 27(4), 537-557.
- Hensvik, L., & Nilsson P. (2010). *Business, buddies and Babies*. IFAU Working Paper.
- Hernes, G. (1972). The process of entry into first marriage. *American Sociological Review*, 37(2), 47–82.
- Hobcraft, J., & Kiernan, K. (1995). Becoming a parent in Europe. In EAPS-IUSSP (Ed.), *European Population Conference* (Vol. 1, pp. 27-65). Milan: Franco Angeli.

-
- Huang, P., Smock P. J., Bergstrom-Lynch C., & Manning W. (2011) 'He Says, She Says': Gender and Cohabitation. *Journal of Family Issues*, 32(7), 876-905.
- Joyner K, Peters H.E., Hynes K., Sikora A., Taber J.R., & Rendall M.S. (2012). The Quality of Male Fertility Data in Major U.S. Surveys, *Demography*, 49(1), 101–124.
- Katz M. L., & Shapiro C. (1985). Network externalities, competition, and compatibility. *American Economic Review*, 75(3), 424-440.
- Keim, S., Klärner A., & Bernardi L. (2009). Qualifying social influence on fertility intentions: composition, structure, and meaning of fertility-relevant social networks. *Current Sociology*, 57(6), 1–20, 2009.
- Kennedy, S., & Bumpass, L. L. (2008). Cohabitation and children's living arrangements: New estimates from the United States. *Demographic Research*, 19(47), 1663-1692.
- Kiernan, K. (1999). Childbearing outside marriage in Western Europe. *Population Trends*, 98, 11–20.
- Knecht, A., Baerveldt C., Snijders T.A.B., Steglich C., & Raub W.. (2010). Friendship and Delinquency in Early Adolescence: A study of selection and influence effects. *Social Development*, 19, 494-514.
- Kohler, H.-P. (2001). *Fertility and Social Interaction. An Economic Perspective*. Oxford: Oxford University Press.
- Kohler, H.-P., Billari F. C., & Ortega J. A. (2002). The emergence of lowest-low fertility in Europe during the 1990s. *Population and Development Review*, 28(4), 641–681.
- Kohler, H.-P., Billari F. C., & Ortega J. A. (2006). Low fertility in Europe: Causes, implications and policy options. In F. R. Harris (Ed.), *The Baby Bust: Who will do the Work? Who Will Pay the Taxes?* (pp. 48–109). Lanham, MD: Rowman and Littlefield Publishers.
- Kohler, H.-P., Behrman J. R., & Watkins S. C. (2001). The density of social networks and fertility decisions: evidence from S. Nyanza District, Kenya. *Demography*, 38(1), 43-58.
- Kravdal, Ø. (2001). The High Fertility of College Educated Women in Norway: An Artefact of the Separate Modelling of Each Parity Transition. *Demographic Research*, 5(6), 187-216.
- Kuziemko, I. (2006). *Is Having Babies Contagious? Fertility Peer Effects Between Adult Siblings*. Princeton University Working Paper.
- Lazarsfeld, P. F., & Merton R. K. (1954). Friendship as Social Process. In Monroe Berger, Theodore Abel and Charles Page (Ed.), *Freedom and Control in Modern Society* (pp. 18-66). New York: Octagon.
- Lesthaeghe, R. & Surkyn, J. (1988). Cultural dynamics and economic theories of fertility change. *Population and Development Review*, 14(1), 1-45.
- Liefbroer, A. C. (1999). From youth to adulthood: Understanding changing patterns of family formation from a life course perspective. In L. J. G. Van Wissen and P. A. Dykstra (Ed.), *Population Issues. An Interdisciplinary Focus* (pp.53-86). New York: Kluwer Academic/Plenum Publishers.
- Liefbroer, A. C., & Billari, F. C. (2010). Bringing Norms Back In: A Theoretical and Empirical Discussion of Their Importance for Understanding Demographic Behaviour. *Population, Space and Place*, 16(4), 287-305.

-
- Lillard, L. A. (1993). Simultaneous equations for hazards: Marriage duration and fertility timing. *Journal of econometrics*, 56(1-2), 189-217.
- Lillard, L.A., Brien M.J., & Waite L.J. (1995). Premarital Cohabitation and Subsequent Marital Dissolution: A Matter of Self-Selection? *Demography*, 32(3), 437-457.
- Lyngstad, T. H., & Prskawetz A. (2010). Do siblings' fertility decisions influence each other? *Demography*, 47(4), 923-934.
- McDermott, R. Fowler J.H., & Christakis N.A. (2009). *Breaking Up Is Hard to Do, Unless Everyone Else Is Doing It Too: Social Network Effects on Divorce in a Longitudinal Sample Followed for 32 Years*. SSRN working paper. <http://ssrn.com/abstract=1490708>
- Manning, W. D. (2005). Cohabitation, Marriage, and Entry into Motherhood. *Journal of Marriage and the Family*, 57(1), 191-200.
- Manning, W. D. & Smock, P. J. (1995). Why Marry? Transitions to Marriage Among Cohabitors. *Demography*, 32(4), 509-520.
- Manning, W. D., Longmore M. A., & Giordano P. C. (2007). The Changing Institution of Marriage: Adolescents' Expectations to Cohabit and to Marry. *Journal of Marriage and Family*, 69(3), 559-575.
- Manski, C. F. (1995). *Identification problems in social sciences*. Harvard: Harvard University Press.
- Manski, C. F., & Mayshar, J. (2003). Private incentives and social interactions: Fertility puzzles in Israel. *Journal of the European Economic Association*, 1(1), 181-211.
- Manski, C. F. (1993). Identification of Endogenous Social Effects: The Reflection Problem. *The Review of Economic Studies*, 60(3), 531-42.
- McPherson, J. M., Smith-Lovin L., & Cook J. M.. (2001). Birds of a Feather: Homophily in Social Networks. *Annual Review of Sociology*, 2, 415-44.
- Mercken, L, Snijders T. A. B., Steglich C., & de Vries H. (2009). Dynamics of Adolescent Friendship Networks and Smoking Behavior: Social Network Analyses in Six European Countries. *Social Science and Medicine*, 69(10), 1506-1514.
- Mills, M. & Blossfeld H.-P. (2005). Globalization, Uncertainty and the Early Life Course: A Theoretical Framework. In H.-P. Blossfeld, Klijzing E., Mills M., & Kurz K. (Ed.) *Globalization, Uncertainty and Youth in Society* (pp. 1-24). London: Routledge.
- Mills, M., Rindfuss R.R., McDonald P., & te Velde E. (2011). Why do people postpone parenthood? Reasons and social policy incentives. *Human Reproduction Update*, 17(6), 848-860.
- Montgomery M. R., & Casterline J. B. (1996). Social Influence, Social Learning, and New Models of Fertility. In J. Casterline, Lee R., & Foote K. (Ed.). *Fertility in the United States: New Patterns, New Theories* (pp. 87-99). Supplement to *Population and Development Review*, 22, 100-107.
- National Vital Statistics System National, CDC/NCHS. <http://www.cdc.gov/nchs/nvss.htm>
- Nazio, T., & Blossfeld H.-P. (2003). The Diffusion of Cohabitation among Young Women in West Germany, East Germany and Italy. *European Journal of Population*, 19(1), 47-82.
- Pastor-Satorrás, R., & Vespignani A. (2001). Epidemic Spreading in Scale-Free Networks. *Physical Review Letters*, 86(14), 3200-3203.

-
- Patacchini E., & Zenou Y. (2012). Juvenile Delinquency and Conformism. *Journal of Law, Economics, and Organization*, 1, 1-31.
- Pollard, M. S., Tucker J. S., Green H. D., Kennedy D., & Go M.-H. (2010). Friendship Networks and Trajectories of Adolescent Tobacco Use. *Addictive Behaviors*, 35(7), 678-685.
- Rasbash, J., Steele F., Browne W.J., & Prosser B. (2004). *A User's Guide to MLwiN, Version 2.0*. London: Institute of Education.
- Rijken, A. J., & Liefbroer A.C. (2009). Influences of the family of origin on the timing and quantum of fertility in the Netherlands. *Population Studies*, 63(1), 71–85.
- Rindfuss, R. R., Morgan S. P., Swicegood G. (1988). *First Births in America: Changes in the Timing of Parenthood*. Berkeley: University of California Press.
- Ryan, S., Franzetta K., Schelar E., & Manlove J. (2009). Family structure history: links to relationship formation behaviors in young adulthood. *Journal of Marriage and Family*, 71(4), 935–953.
- Santelli, J.S., & Melnikas A. J. (2010). Teen Fertility in Transition: Recent and Historic Trends in the United States. *Annual Review of Public Health*, 31, 371-383.
- Schoen, R., Landale N. S., & Daniels K. (2007). Family transitions in young adulthood. *Demography*, 44(4), 807-820.
- Smock, P. J., Casper L., & Wyse J. (2008). *Nonmarital cohabitation: current knowledge and future directions for research*. Report 08-648, Population Studies Center, University of Michigan.
- Smock, P. J., & Greenland F. S. (2010). Diversity in Pathways to Parenthood: Patterns, Implications, and Emerging Research Directions. *Journal of Marriage and Family*, 72(3), 576-93.
- Stanley, S. M., Kline Rhoades, G. & Markman, H. J. (2006). Sliding Versus Deciding: Inertia and the Premarital Cohabitation Effect. *Family Relations*, 55(4), 499–509.
- Steele, F., Kallis, C., Goldstein, H., & Joshi, H. (2005). The relationship between childbearing and transitions from marriage and cohabitation in Britain. *Demography*, 42(4), 647-673.
- Steele, F., Joshi, H., Kallis, C., & Goldstein, H. (2006). Changing compatibility of cohabitation and childbearing between young British women born in 1958 and 1970. *Population Studies*, 60(2), 137-152.
- Thornton, A., Axinn, W. G., & Hill, D. H. (1992). Reciprocal effects of religiosity, cohabitation, and marriage. *American Journal of Sociology*, 98(3), 628 – 651.
- Thomson, E., Winkler-Dworak, M., Spielauer, M., & Prskawetz, A. (2012). Union Instability as an Engine of Fertility? A Microsimulation Model for France. *Demography*, 49(1), 175-195.
- Topa, G.. (2001). Social Interactions, Local Spillovers and Unemployment. *Review of Economic Studies*, 68(2), 261-95.
- Uecker, J. E., & Stokes C. E. (2008). Early Marriage in the United States. *Journal of Marriage and Family*, 70(4), 835–846.
- Upchurch, D.M., Lillard L.A., & Panis C.W.A. (2002). Nonmarital Childbearing: Influences of Education, Marriage, and Fertility. *Demography*, 39(2), 311–29.

Tables

Table 1: Descriptive statistics of the sample

	Marriage		Childbearing		Total
	Single	Married	Childless	Mothers	
Parent education					
<i>Less than High school</i>	10.2	10.4	8.0	13.2	10.3
<i>High school or equivalent</i>	31.8	34.1	27.7	38.8	32.6
<i>Some College</i>	18.2	20.3	18.9	19.0	19.0
<i>College education or more</i>	30.5	26.1	37.8	17.6	28.8
<i>Unknown</i>	9.3	9.1	7.5	11.4	9.2
Family type					
<i>Living with both parents at Wave I</i>	53.5	56.4	63.1	43.9	54.6
<i>Living in a step family at Wave I</i>	9.3	10.7	7.5	12.8	9.8
<i>Living with single mother at Wave I</i>	30.0	27.5	24.4	34.9	29.1
<i>Living with single father at Wave I</i>	2.3	1.8	1.6	2.7	2.1
<i>Living in other typology of family at Wave I</i>	4.9	3.6	3.5	5.6	4.4
Parental religiosity					
<i>Low/not religious</i>	65.9	63.3	62.8	67.6	65.9
<i>High</i>	34.1	36.7	37.2	32.4	35.1
Race					
<i>Hispanic</i>	9.5	11.1	9.3	11.1	10.1
<i>Black</i>	33.6	13.5	21.9	31.2	26.1
<i>Asian</i>	5.6	2.5	6.2	2.3	4.5
<i>White</i>	51.3	72.9	62.5	55.5	59.4
Parental Income					
<i>1st quintile</i>	23.2	21.8	17.6	29.3	22.6
<i>2nd quintile</i>	20.5	20.0	16.5	25.3	20.3
<i>3rd quintile</i>	20.3	23.9	21.7	21.6	21.6
<i>4th quintile</i>	17.4	19.1	20.3	15.1	18.1
<i>5th quintile</i>	18.8	15.2	24.0	8.8	17.4
Average number of siblings	1.53	1.57	1.49	1.70	1.55
Average number of friends (Min: 0; Max: 6)	0.76	0.80	0.78	0.76	0.78
Average number of peers (Min: 0; Max: 10)	3.65	3.50	3.41	3.57	3.51
Mothers	32.7	63.5	-	-	44.2
Married	-	-	24.5	53.8	37.5
Median age at first marriage	-	28.08	-	-	-
Median age at first birth	-	-	-	26.67	-
Number of women observed	1190	713	1061	842	1903

Table 2: Coefficient estimates (fixed part only) of two independent complementary log-log (cloglog) discrete time hazards of getting married and becoming a parent

	Marriage			Childbearing		
	Coefficients	S.E.	Sig.	Coefficients	S.E.	Sig.
Constant	-30.900	3.457	***	-21.161	1.873	***
Age	1.985	0.315	***	1.460	0.182	***
Age squared	-0.038	0.007	***	-0.034	0.004	***
Black (ref: non-black)	-1.535	0.226	***	0.338	0.123	**
Intact family (other types of family)	0.031	0.154		-0.326	0.110	**
1 st income quintile (ref: 5 th income quintile)	0.563	0.241	*	0.854	0.197	***
2 nd income quintile	0.233	0.225		0.963	0.190	***
3 rd income quintile	0.149	0.198		0.778	0.186	***
4 th income quintile	0.100	0.201		0.486	0.195	*
Number of friends	-0.014	0.047		-0.049	0.036	
Parents went at least to college (ref: lower education)	-0.132	0.140		-0.477	0.105	***
Parental religiosity (ref: no)	0.529	0.135	***	-0.187	0.117	
Number of siblings	0.022	0.055		0.109	0.037	**
Married (ref: non married)				1.549	0.130	***
Number of friends who became parents				0.234	0.091	*
Number of peers who became parents				0.053	0.041	
Number of friends who got married	0.149	0.112				
Number of peers who got married	0.103	0.051	*			
N	1903					
Number of spells	149520					

* $p < 0.05$. ** $p < 0.01$ *** $p < 0.001$

Table 3: Coefficient estimates (fixed part only) of a multiprocess model composed by two complementary log-log (cloglog) discrete time hazards of getting married and becoming a parent

	Marriage			Childbearing		
	Coefficient	S.E.	Sig.	Coefficient	S.E.	Sig.
Constant	-31.787	3.464	***	-20.901	1.867	***
Age	2.062	0.316	***	1.425	0.182	***
Age squared	-0.039	0.007	***	-0.033	0.004	***
Black (ref: non-black)	-1.448	0.224	***	0.310	0.123	*
Intact family (other types of family)	0.003	0.153		-0.344	0.110	**
1 st income quintile (ref: 5 th income quintile)	0.634	0.238	**	0.860	0.197	***
2 nd income quintile	0.309	0.222		1.002	0.190	***
3 rd income quintile	0.201	0.197		0.782	0.186	***
4 th income quintile	0.119	0.200		0.501	0.196	*
Number of friends	-0.018	0.047		-0.049	0.036	
Parents went at least to college (ref: lower education)	-0.174	0.138		-0.475	0.105	***
Parental religiosity (ref: no)	0.460	0.134	***	-0.174	0.108	
Number of siblings	0.028	0.054		0.114	0.038	**
Married (ref: non married)				1.198	0.128	***
Number of friends who became parents				0.241	0.091	**
Number of peers who became parents				0.059	0.041	
Number of friends who got married	0.150	0.111				
Number of peers who got married	0.101	0.051	*			
N	1903					
Number of spells	149520					

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

Table 4: Estimated random-effect covariance matrix of the multiprocess model

	Marriage	Childbearing
Marriage	1	
Childbearing	0.561(0.106)*** <i>Corr. = 0.56</i>	1

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$ from Wald test

Note: The reported values are the estimated variance of each random effect. The off-diagonal cell represents the covariance with standard error in parentheses and correlation between the two random effects.

Table 5: Coefficient estimates (fixed part only) of a multiprocess model composed by two complementary log-log (cloglog) discrete time hazards of getting married and becoming a parent only for the religious group.

	Marriage			Childbearing		
	Coefficient	S.E.	Sig.	Coefficient	S.E.	Sig.
Constant	-32.264	5.092	***	-19.033	3.035	***
Age	2.140	0.466	***	1.197	0.291	***
Age squared	-0.042	0.011	***	-0.027	0.007	***
Black (ref: non-black)	-1.296	0.280	***	0.331	0.191	
Intact family (other types of family)	0.082	0.254		-0.481	0.189	*
1 st income quintile (ref: 5 th income quintile)	0.852	0.407	*	0.755	0.343	*
2 nd income quintile	0.691	0.338	*	1.130	0.311	***
3 rd income quintile	0.389	0.302		0.773	0.305	*
4 th income quintile	0.433	0.298		0.614	0.313	*
Number of friends	-0.051	0.065		-0.138	0.061	*
Parents went at least to college (ref: lower education)	-0.062	0.211		-0.301	0.173	
Number of siblings	0.018	0.072		0.093	0.055	
Married (ref: non married)				1.293	0.190	***
Number of friends who became parents				0.315	0.136	*
Number of peers who became parents				0.092	0.065	
Number of friends who got married	0.285	0.135	*			
Number of peers who got married	0.126	0.074				
N	669					
Number of spells	59513					

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

Table 6: Estimated random-effect covariance matrix of the multiprocess model for the religious group

	Marriage	Childbearing
Marriage	1	
Childbearing	0.766(0.161)*** <i>Corr. = 0.76</i>	1

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$ from Wald test

Note: The reported values are the estimated variance of each random effect. The off-diagonal cell represents the covariance with standard error in parentheses and correlation between the two random effects.