Peer Effects in Young Adults' Marital Decisions[1]

(Preliminary, comments welcome)

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September 13, 2011

Abstract. This paper tries to identify peer group effects on marital decisions. We use data from Waves I and III of the National Longitudinal Study of Adolescent Health (Add Health). This database contains detailed information on adolescents' high school friends as well as their marital behavior later in life. We construct a balanced panel for the years 1998-2002 using the calendar of all past and current relationships of the respondents, and we match friends in a way that allows to recover the marital status of each individual and of her friends at any given year. Hence, we are able to analyze how the marital transitions of individuals depend on the marital status of their friends. Following the literature we instrument friends' marital status using the contextual variables. Moreover, we use a fixed effects panel data estimator in order to deal with the correlated effects. Preliminary results after controlling for various observable, family, and contextual characteristics, out of wedlock births, and relationship duration indicate that peer effects in marital decisions are significant, especially among females. Robustness checks using former and placebo friends support our results, and indicate that actual peers do matter.

JEL classifications: A14, J12, J16, Z13

Keywords: peer effects, friends, marriage, cohabitation, marital decisions

[1]I am grateful to Nezih Guner for his valuable advice and guidance. Many thanks to Juan Jose Dolado, Francesco Fasani, Daniel Garcia, Christos Genakos, James Heckman, Ezgi Kaya, Valérie Lechene, Jeremy Lise, Matilde Machado, Heiko Rachinger, Anna Sanz de Galdeano, Konstantinos Tatsiramos, the participants in the UC3M Student Workshop, in the UCL Student Work in Progress Seminar, in the ESPE 2011 conference, and in the CRETE 2011 conference for useful discussions.

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1 Introduction

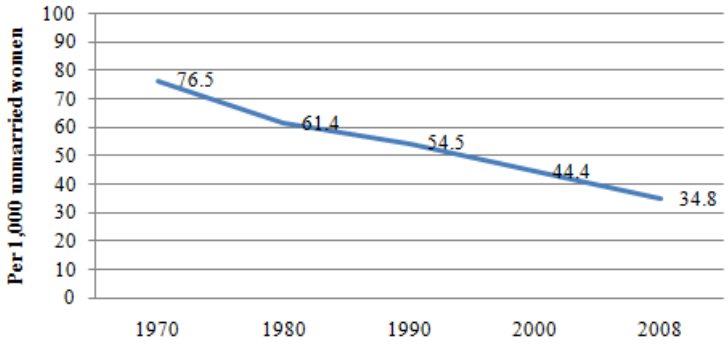
Friends are an important part of individuals' life and constitute, together with the family, the social circle in which individuals develop. Friends often spend time together participating in the same activities (sports, school, etc), discussing about different topics and exchanging ideas. It is not then unrealistic to think that friends might affect each other's behavior through their opinions or even through imitation. In fact, there is a large literature on peer effects showing that friends actually affect, among others, the individual performance at school (Calvó-Armengol, Patacchini and Zenou, 2009), obesity (Cohen-Cole and Fletcher, 2008), smoking habits (Fletcher, 2010), alcohol consumption (Fletscher, 2011), fertility (Kuziemko, 2006; Ciliberto, Miller, Nielsen, and Simonsen, 2010; Hensvik and Nillson, 2010), the probability of finding a job (Calvó-Armengol and Jackson, 2004; Cappellari and Tatsiramos, 2010), and the probability of engaging in criminal activities (Patacchini and Zenou, 2011).[3]

But what about marital decisions? Getting married or cohabiting is a decision that many young couples face. In order to make a decision, a potential couple might ask their parents, sibling or friends. Cohabitation, i.e. living together without being married can be against the religion or the parents' will. However, if most of a couple's friends are cohabiting the couple might also decide to do so. Likewise, if most friends of an individual are married, she may also want to get married in order, for example, to avoid being stigmatized by her friends. In this way, what the couple considers as a norm depends not only on the society as a whole (e.g. religion or tradition) but also on one's circle of close friends. The question we try to answer is whether the marital decisions of one's friends have any effect on one's own marital decisions.

During the last decades many rapid changes in marital behavior took place. As Figure 1 shows, the marriage rate in the US has fallen drastically. Many studies have tried to identify the factors behind this drop (declining gender gap, Becker 1981; contraceptive pill, Goldin & Katz, 2002; household production technology, Greenwood & Guner, 2009 to name a few). These forces are likely to be amplified if there exist peer group effects that create a social multiplier.

[3]See Blume, Brock, Durlauf, and Ioannides (2011) for a detailed review of papers on social interactions.

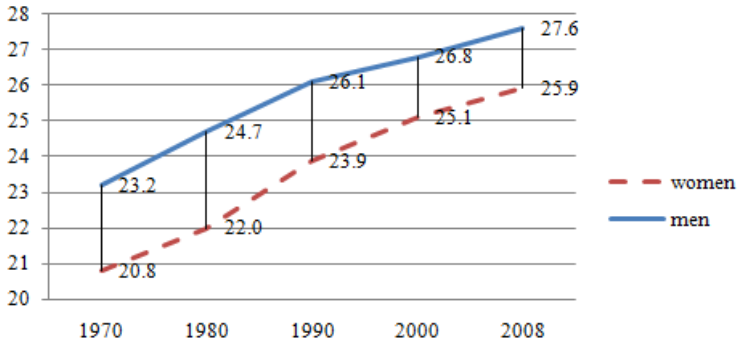
Figure 1. Marriage Rate in the U.S.



Source: National Center for Family & Marriage Research

Part of this drop is also due to the increase in the median age at first marriage (Figure 2). Individuals nowadays get married at an older age than what they used to do in the past. Hence, also the timing of marriage may be contagious in the sense that individuals decide to get married after observing that one of their peers got married.

Figure 2. Estimated Median Age at First Marriage in the U.S.

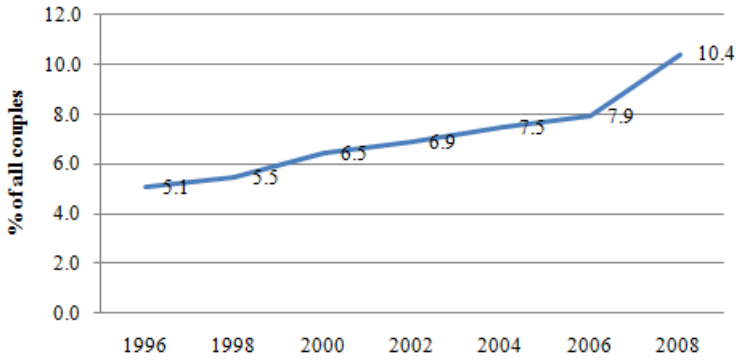


Source: U.S. Census Bureau

Cohabitation is a more recent phenomenon that is becoming more and more popular especially among young couples (Bumpass & Lu, 2000). This upward trend (Figure 3), that is also present in western European countries, has been attributed to economic factors like the gender wage gap and the household production technology (Adamopoulou, 2010), female labor force participation and tertiary education (Kalmjin, 2007) or tax reforms (Leturcq, 2009). In addition to these factors, there might be an imitation

effect (peer effect) at work that self-enforced the increase of cohabitation. Our aim is to identify peer effects in the decision to get married or cohabit as well as in the timing of these actions.

Figure 3. Cohabitation Rate in the U.S.



Source: U.S. Census Bureau

The biggest obstacle in identifying peer effects in marital decisions of the individuals has been data availability. In order to investigate the extent of peer group effects, Billari et al. (2007) use simulated data to show that social influence is the key driving force of the process of first marriage. Drewianka (1999 and 2003) uses county data from PUMS and shows that a 10 percentage point increase in the fraction of persons aged 16-44 in a county group who are single leads to a decrease in individual's propensity to marry of an order of 1.5-2.0 percentage points. Moreover, he finds evidence that social effects operate through markets (search process, economies of scale in the production of goods not equally enjoyed by married and single people) and not directly through stigma or role modelling. Not only initiation but also termination of marriage might be influenced by peers. McDermott, Folwer, and Christakis (2009) show that divorce can spread between friends, siblings and coworkers. We use data from the National Longitudinal Study of Adolescent Health (Add Health). This database enable us to identify peer effects in marital decisions among high school friends as we will see below. In the next section we use a model of conformism in order to study a possible way friends can influence an individual's marital decisions. The model will motivate the empirical analysis that will follow.

2 Model

The model is based on Patacchini and Zenou (2011), who study juvenile delinquency using a model of conformism. The key element of the model is the notion of conformism, i.e., quoting the authors description, *'the idea that the easiest and hence best life is attained by doing one's very best to blend in with one's surroundings and to do nothing eccentric or out of the ordinary in any way'.* Conformism might also be important for young adults when they decide whether to get married or cohabit. We first define the network structure of agents' friendships, and we then describe the preferences of the agents.

There is a finite number of agents $N = \{1, ..., n\}$. Let g denote a particular network. We use the n-square adjacency matrix G of a network g to keep track of the direct connections in this network (see Jackson, 2008). Two agents i and j are directly connected in the network g if and only if $g_{ij} = 1$, and $g_{ij} = 0$, otherwise. We set $g_{ii} = 0$, i.e. the agent cannot be a friend of herself. The set of direct connections of agent i is $N_i(g) = \{j \neq i \mid g_{ij} = 1\}$, which is of size $g_i = \sum_{j=1}^{n} g_{ij}$. In general $N_i(g) \neq N_j(g)$, unless the network is complete and everybody is a friend of everybody.

Each agent decides whether to stay single and just date with a partner, cohabit or get married. We assume, therefore, that there are many different degrees of formality that the relationship can take ranging from very informal (dating) to very formal (getting married). We denote the formality of the relationship by $f_i(g)$. We assume that $f_i(g)$ is continuous. We then define as the average formality of the relationships of i's friends as $\overline{f_i}(g) = \frac{1}{g_i} \sum_{j=1}^{n} g_{ij} f_j$

Each agent selects a degree of formality $f_i \geq 0$ for her relationship and receives a payoff $u(f_i, \overline{f_i})$ given by the utility function

$$u_i(f_i, \overline{f_i}) = a + b_i f_i - \pi f_i \phi - c f_i^2 - d(f_i - \overline{f_i})^2,$$

with $a, c, d > 0$, and $b_i > 0$, $\forall i$.

There is a benefit from formalizing the relationship, which is given by the term $a + b_i f_i$. The agents are ex ante heterogeneous with respect to b_i. The parameter b_i is assumed to be deterministic and observable by all agents in the network and it represents observable characteristics of individual i (e.g., gender, race, age, education,

religion etc.) and to the observable average characteristics of individual i's friends (contextual effects). More specifically,

$$b_i(x) = \sum_{m=1}^{M} \beta_m x_i^m + \frac{1}{g_i} \sum_{m=1}^{M} \sum_{j=1}^{n} \theta_m g_{ij} x_j^m,$$

where x_i^m are observable characteristics of individual i, the term $\frac{1}{g_i} \sum_{m=1}^{M} \sum_{j=1}^{n} g_{ij} x_j^m$ captures the contextual effects, and β_m, θ_m are parameters.

There is also a cost from formalizing the relationship, which is given by the term $-\pi f_i \phi - c f_i^2$. The parameter π is the probability that the relationship ends and ϕ is the cost of ending the relationship. The cost of ending a relationship increases as the formality increases, i.e. it is more costly to separate if one is married than if one is cohabiting. Likewise, it is more costly to separate if one is cohabiting with a partner than if one is just dating this partner. The term $-cf_i^2$ is needed so as the utility function to be concave. We can think of cf_i^2 as the cost of formalizing the relationship in terms of legal requirements. Transiting from cohabitation to marriage is a more complicated procedure than transiting from dating to cohabitation.

The last term in the utility function, $-d(f_i - \overline{f_i})^2$, reflects the influence of friends' behavior on own action. Each agent tries to minimize the distance between herself and her group of friends. The agent loses utility from failing to conform to others. d is the parameter of taste for conformity. The taste for conformity d might be different for males and females.

In this framework there exists a unique Nash equilibrium (Patacchini and Zenou, 2011) where each individual chooses the optimal formality of relationship f_i^*

$$f_i^* = \frac{d}{c+d} \overline{f_i} + \frac{b_i}{2(c+d)} - \frac{\pi \phi}{2(c+d)},$$

which is increasing in $\overline{f_i}$. In other words, the more formal the relationships of one's friends are, the more the individual will formalize her own relationship.

In the next section we test this result empirically and we try to figure out whether the percentage of individuals' married and cohabiting friends has any effect on individuals' decisions to enter marriage or cohabitation.

3 Data

We use data from the National Longitudinal Study of Adolescent Health (Add Health).[4] Add Health is a longitudinal study of a nationally representative sample of adolescents in grades 7-12 in the United States during the 1994-95 school year. Adolescents had to answer questions about their family background, school performance, area of residence, tobacco and alcohol consumption, criminal activities as well as about sexual behavior (contraception, pregnancy, HIV and STD). The Add Health cohort has been followed into young adulthood with four in-home interviews (Waves I-IV), the most recent in 2008, when the sample was aged 24-32.

Wave III interviews took place in years 2001 and 2002. In Wave III the respondents had to list all their current and previous sexual relationships (82% non missing responses) providing detailed information on the starting and ending date, whether they cohabited and how long, when they got married etc. Using this information we create a balanced panel for the years 1995-2002. For example, if a respondent listed a relationship with a partner for the years 2000-2002 with whom he started cohabiting in 2001 and he got married in 2002, we will consider her single for the year 2000, cohabiting in 2001, and married in 2002. If the respondent had more than one relationship in a given year we keep the one with the longest overall duration. The procedure is similar to the one in Xie et al. (2003), Raley et al. (2007) that analyze the determinants of marital transitions. These studies however do not consider peer group effects.

In Wave I each participating school provided a student roster. Data collectors assigned an identification number to each name and provided copies of the rosters to students for identifying their friends (up to five males and five females) as they filled out the questionnaire. As long as their nominated friends were also interviewed, one can construct for each respondent a set of friends with detailed Add Health information. In Wave III, when the respondents are between ages 18 and 28, those who were in grades 7 and 8 in Wave I (the youngest cohort), were interviewed about the current and former friends. In particular, data collectors presented each respondent with a list of 10 names and asked if any of them is currently or used to be their friend.

[4]This research uses data from AddHealth, a program project designed by J. Richard Udry, Peter S. Bearman, and Kathleen Mullan Harris. Special acknowledgment is due to Ronald R. Rindfuss and Barbara Entwisle for assistance in the original design. Persons interested in obtaining data files from AddHealth should contact AddHealth, Carolina Population Center, 123 W. Franklin Street, Chapel Hill, NC 27516-2524, USA (addhealth@unc.edu).

This list was created, based on an algorithm, using information from club membership and other school activities. As a result, it is possible for some respondents to identify current friends as well as former friends with information about the year that the friendship has ended. We treat two students as friends if at least one of the two has identified the other as his/her best friend. By matching the identification numbers of the friendship nominations to respondents' identification numbers we obtain information on the characteristics of nominated friends. In this we way know at any given year the marital status of the respondent and the marital status of his/her friends.

4 Empirical Strategy

Individual behavior may move conjointly with average peer group behavior for three different reasons. i) Endogenous effects; the behavior of the individual is causally influenced by the behavior of the group. This is the peer effect that we are trying to estimate. ii) Contextual effects; the behavior of the individual is influenced by the characteristics of the group. For example an individual might decide to get married because her friends are very religious independently from whether the friends are married or not. iii) Correlated effects; the individual and the group behave in the same way due to similar environments or unobservables (endogenous friendship formation/sorting). This problem arises from the fact that individuals select the school they attend as well as their friends or because both the individual and her friends are subject to common unobserved shocks.

Manski (1993) shows that identifying the endogenous and the contextual effects separately in a reduced form linear model is not possible. This is called reflection problem and it is due to the fact that group behavior is by definition the aggregation of individual behavior. Solutions that have been proposed in order to solve the reflection problem consist of using an IV, using panel data or network data. Examples of IVs include Kuziemko (2006) that used the fertility of the siblings of one's colleagues as an instrument for the fertility of one's colleagues, and Fletscher (2011) that uses the alcohol consumption of the parents of one's classmates as an instrument for the alcohol consumption of one's classmates. Cappellari and Tatsiramos (2010) use panel data, where the reflection problem disappears since the characteristics of the friends are already determined at the time of the transition. Pattacchini and Zenou (2011) use

network data where the reflection problem is also eluded. This is because in the case of network data the reference group of each individual (nominated friends) is different.[5]

Now let us focus on the correlated effects. One might worry that people make new friends as they get married, often through their spouse. In the current analysis we consider friends since high school and we have information about friendship dynamics. This solves part of the endogenous friendship formation in later years. But there can be still endogeneity in friendship destruction. Solutions to the correlated effect that have been proposed in the literature include a panel data fixed effects estimator and a network fixed effects estimator for cross-sectional data (pseudo fixed effects). Assuming that any correlation between the behavior of the peers and individual unobserved traits is due to traits that do not vary over time a panel data fixed effect estimator can deal with the correlated effect. This is the estimator we are also going to employ. Further robustness/falsification tests show that the peer effect is not due to sorting.

5 Regression analysis

The benchmark regression is

$$f_{it} = \overbrace{\xi \overline{f_{it}}}^{\text{endogenous effects}} + \underbrace{\sum_{m=1}^{M} \beta_m x_{it}^m}_{\substack{\text{individual characteristics} \\ \text{(gender, age, race, etc)}}} + \underbrace{\frac{1}{g_i} \sum_{m=1}^{M} \sum_{j=1}^{n} \theta_m g_{ij} x_{jt}^m}_{\substack{\text{average peer characteristics} \\ \text{(contextual effects)}}} + y_t + \varepsilon_{it}$$

where f_{it}, is a binary variable that takes the value 1 if an individual is married, and 0 otherwise, $\overline{f_{it}}$ is the percentage of married and cohabiting peers, x_{it}^m are the individual characteristics of the respondents (m variables that include gender, age, education, race, religiosity,and beauty), $\frac{1}{g_i} \sum_{j=1}^{n} g_{ij} x_{jt}^m$ are the average individual characteristics of $i's$ n peers (contextual variables), i.e. the percentage of female peers, average age, average education, percentage of African American peers, average religiosity, average beauty, and y_t are year dummies.

[5] By contrast, in absence of network data, the peer group of each individual consists of the average of all the others (in a class, in a school, in a firm etc)

5.1 Wave I nominations

We first examine the determinants of the transition into marriage using the friends nominations from Wave I. Hence, we assume that friendships have lasted after high school. This assumption will be relaxed afterwards using the updated information from Wave III (only for the subsample that this information is available). Table 1 shows the descriptive statistics for a total of 2,644 respondents with non missing own and peer relationship information.

Table 1. Individual characteristics in 2002[1,2] (Wave I nominations)

Characteristic	
% girls	55.27
Mean Age	22.42
% cohabiting	19.24
% married	16.94
% African American	10.57
% with college education	61.09
Mean Religiosity (7-category scale)	1.95
Mean Beauty (5-category scale)	3.57

[1] Individuals with non missing own and peers' relationship history

[2] Corrected for survey design

We start our analysis with a linear probability model (Table 2, column 1). The dependent variable takes the value 1 if someone gets married, and the value 0 if someone is single (alone or just dating). The variables of interest are the ratio of each individual's friends that are cohabiting and the ratio of friends that are married. We include as regressors the characteristics of the individuals, such as age, gender, race, education, religiosity, and a measure of beauty (the interviewer had to assess the physical attractiveness of the respondent). All variables are explained in the appendix. We also account for parental characteristics, such as the parental marital status at Wave I, mother's education and mother's age at marriage. We include year dummies in all specifications. We use the appropriate weights and robust standard errors clustered at the school level. In this specification we also include contextual variables, i.e. the average individual characteristics of the peers. The percentage of married peers

has a statistical significant effect on the transition into marriage. The percentage of cohabiting peers does not seem to matter.

Table 2. Determinants of transition into marriage (Pooled OLS and 2SLS)

	(1)	(2)
Specification	Pooled OLS	2SLS
Definition of Peers	Nominated friends	Nominated friends
% married peers	0.035***	0.095**
% cohabiting peers	0.010	-0.005
Individual characteristics	Yes	Yes
Parental characteristics	Yes	Yes
Contextual characteristics	Yes	Used as instruments
No of person-years	15,161	15,161
R^2	0.047	0.064
F statistic	-	6.55; 16.46
J statistic p value	-	0.147

*** p<0.01, ** p<0.05, * p<0.1 (robust s.e. clustered at school level), cross sectional weights used

Individual characteristics: gender, age, education, race, religiosity, beauty

Parental characteristics: marital status at Wave I, mother's education, mother's age at marriage

Year dummies included in all specifications

We then perform 2SLS in order to improve the identification (Table 2, column 2). Following the literature (e.g. Gaviria and Raphael, 2001) we assume that the contextual variables do not have any effect (indeed their effect was statistically insignificant in the OLS) and we exclude them from the regression. Instead, we use these contextual variables as an instrument for the percentage of married and cohabiting peers. The F statistic is not so high indicating that the instrument can be weak but the J statistic does not reject the hypothesis of the validity of the instruments. The peer effect of married peers remains statistical significant and its magnitude increases.

Alternatively, we perform a panel data fixed effect estimation that also can deal with the reflection problem (Table 3, column 1). In this specification we include only time varying variables (age, education), and in addition to them, out of wedlock births and the duration of the relationship. The peer effect remains significant but decreases

in magnitude.[6]

Lastly, we extend our network to include not just the nominated friends but also the friends of friends (Table 3, column 2). At first, we thought that we could use the marital status of friends of friends as an instrument but it turns out that it is not valid. Instead, extending the network of friends increases the size of the peer effect. This result supports the existence of spill-over effects.

Table 3. Determinants of transition into marriage (Fixed effects)

	(1)	(2)
Specification	Linear Prob/FE	Linear Prob/FE
Definition of Peers	Nominated friends	Nominated friends and friends of friends
% married peers	0.056***	0.065***
% cohabiting peers	0.007	0.010
Individual characteristics	age, education	age, education
Parental characteristics	No	No
Births and rel. duration	Yes	Yes
Contextual characteristics	avg. age, education	avg. age, education
No of person-years	15,253	15,253
R^2	-	0.077

*** p<0.01, ** p<0.05, * p<0.1 (robust s.e. clustered at school level), cross sectional weights used

Individual characteristics (time varying): age, education

Year dummies included in all specifications

We also perform the analysis for girls and boys separately to see whether there are any gender differences on the size or the direction of the effect. Indeed, the peer effect on boys (Table 5) is either not statistically significant or smaller than the peer effect on girls (Table 4). This result might reflect a stigma towards unmarried females that is stronger than towards males.

[6] We also conducted the analysis using only same-gender friendships and the peer effect is larger.

Table 4. Girls' determinants of transition into marriage (2SLS and fixed effects)

	(1)	(2)
Specification	2SLS	Linear Prob/FE
Definition of Peers	Nominated friends	Nominated friends
% married peers	0.164*	0.063***
% cohabiting peers	-0.036	0.005
Individual characteristics	Yes	age, education
Parental characteristics	Yes	No
Births and rel. duration	No	Yes
Contextual characteristics	Used as instruments	age, education
No of person-years	8,226	8,295
R^2	-	0.076
F statistic	6.27; 12.14	-
J statistic p value	0.822	-

*** p<0.01, ** p<0.05, * p<0.1 (robust s.e. clustered at school level), cross sectional weights used
Individual characteristics: gender, age, education, race, religiosity, beauty; Parental characteristics: marital status at Wave I, mother's education, mother's age at marriage; Year dummies included

Table 5. Boys' determinants of transition into marriage (2SLS and fixed effects)

	(1)	(2)
Specification	2SLS	Linear Prob/FE
Definition of Peers	Nominated friends	Nominated friends
% married peers	0.036	0.043**
% cohabiting peers	-0.005	0.010
Individual characteristics	Yes	age, education
Parental characteristics	Yes	No
Births and rel. duration	No	Yes
Contextual characteristics	Used as instruments	age, education
No of person-years	6,935	6,958
R^2	-	0.075
F statistic	4.94; 5.10	-
J statistic p value	0.067	-

*** p<0.01, ** p<0.05, * p<0.1 (robust s.e. clustered at school level), cross sectional weights used
Individual characteristics: gender, age, education, race, religiosity, beauty; Parental characteristics: marital status at Wave I, mother's education, mother's age at marriage; Year dummies included

5.1.1 Who conforms?

But who are the ones who conform? In order to answer this question we analyze separately different groups of individuals with respect to religiosity and race. We find that the peer effect vanishes for the non-religious ones (defined as those who have never attended religious services in the past 12 months), and it becomes stronger for the religious ones (Table 6, columns 1 and 2). Moreover, the peer effect is present only for white individuals and not for African Americans (Table 6, columns 3 and 4).

Table 6. Determinants of transition into marriage by characteristic

	(1)	(2)	(3)	(4)
Specification	Linear Prob/FE	Linear Prob/FE	Linear Prob/FE	Linear Prob/FE
Definition of Peers	More Religious	Non-religious	White	African American
% married peers	0.061***	0.026	0.051***	0.028
% cohabiting peers	0.013	-0.008	0.004	0.030
Individual char.	age, educ.	age, educ	age, educ	age, educ
Parental char.	No	No	No	No
Births and rel. dur.	Yes	Yes	Yes	Yes
Contextual char.	avg. age, educ.	avg. age, educ.	avg. age, educ	avg. age, educ
No of person-years	11,461	3,792	13,039	2,214
R^2	0.081	0.073	0.093	0.034

*** p<0.01, ** p<0.05, * p<0.1 (robust s.e. clustered at school level), cross sectional weights used

Individual characteristics (time varying): age, education

Year dummies included in all specifications

5.1.2 Geographical proximity

Geographical proximity is another factor that we embed in our analysis. Small geographical distance between friends may facilitate communication, which in turn may magnify the peer effect. In this case we can think of an underlying mechanism of leisure complementarities, that drives friends into marriage in order to share common interests with their married peers. We use information on the county of residence of the peers and the respondent in wave III (Table 7). Married peers that live in the same county as the respondent have a big statistical significant effect on the transition of the respondent into marriage. By contrast the effect of peers who reside in different counties is smaller and slightly statistical significant.

Table 7. Determinants of transition into marriage by geographical proximity

	(1)	(2)
Specification	Linear Prob/FE	Linear Prob/FE
Definition of Peers	Same county	Different county
% married peers	0.065***	0.042*
% cohabiting peers	-0.007	0.016
Individual char.	age, educ.	age, educ
Parental char.	No	No
Births and rel. dur.	Yes	Yes
Contextual char.	avg. age, educ.	avg. age, educ.
No of person-years	8,335	9,339
R^2	0.076	0.092

*** p<0.01, ** p<0.05, * p<0.1 (robust s.e. clustered at school level)

Individual characteristics (time varying): age, education

Year dummies included in all specifications, cross sectional weights used

5.1.3 Cohabitation

Next, we conduct the same analysis for the transition into cohabitation (Table 8) but we find no statistically significant peer effect. This suggests that conformistic behavior arises only when considering the institution of marriage but not in more informal stages of the relationship.

Table 8. Determinants of transition into cohabitation (2SLS and fixed effects)

	(1)	(2)
Specification	2SLS	Linear Prob/FE
Definition of Peers	Nominated friends	Nominated friends
% married peers	0.045	0.008
% cohabiting peers	0.078	-0.003
Individual characteristics	Yes	age, education
Parental characteristics	Yes	No
Births and rel. duration	No	Yes
Contextual characteristics	Used as instruments	age, education
No of person-years	15,161	15,253
R^2	-	0.043
F statistic	6.55; 16.46	-
J statistic p value	0.682	-

*** p<0.01, ** p<0.05, * p<0.1 (robust s.e. clustered at school level), cross sectional weights used
Individual characteristics: gender, age, education, race, religiosity, beauty; Parental characteristics: marital status at Wave I, mother's education, mother's age at marriage; Year dummies included

5.1.4 Timing of the transition

As we discussed in the abstract, the age of first marriage has increased during the last decades. Hence, it might be the case that the timing of marriages is contagious. To check this we use as regressors whether any peer got married and whether any peer started cohabiting in the last year. The results in Table 9 suggest that the peer effect in the timing of marriage is significant and similar in magnidute as the peer effect in the decision to get married. There is no peer effect in the timing of cohabitation (Table 10). There is evidence of a negative effect on the timing of cohabitation if some peer got married in the last year. This finding is supportive of a conformistic mechanism with respect to marriage.

Table 9. Determinants of the timing of the transition into marriage (Fixed effects)

Specification	Linear Prob/FE
Definition of Peers	Nominated friends
Any peer entered marriage last year	0.038**
Any peer entered cohabitation last year	0.008
Individual characteristics	age, education
Parental characteristics	No
Births and rel. duration	Yes
Contextual characteristics	age, education
No of person-years	13,096
R^2	0.070

*** p<0.01, ** p<0.05, * p<0.1 (robust s.e. clustered at school level), cross sectional weights used
Individual characteristics: gender, age, education, race, religiosity, beauty; Parental characteristics: marital status at Wave I, mother's education, mother's age at marriage; Year dummies included

Table 10. Determinants of the timing of the transition into cohabitation (Fixed effects)

Specification	Linear Prob/FE
Definition of Peers	Nominated friends
Any peer entered marriage last year	-0.033**
Any peer entered cohabitation last year	0.002
Individual characteristics	age, education
Parental characteristics	No
Births and rel. duration	Yes
Contextual characteristics	age, education
No of person-years	13,096
R^2	0.037

*** p<0.01, ** p<0.05, * p<0.1 (robust s.e. clustered at school level), cross sectional weights used
Individual characteristics: gender, age, education, race, religiosity, beauty; Parental characteristics: marital status at Wave I, mother's education, mother's age at marriage; Year dummies included

5.2 Wave III nominations: current friends

As we already mentioned, for the respondents of Wave III who were in the 7th or 8th grade at Wave I, an algorithm, based on clubs and activities from previous data, was used to select 10 names of students who also attended the same school. These respondents were then asked to identify whether or not they were currently or had been previously friends with each of the 10 listed names. Table 11 shows the descriptive statistics for these respondents.[7]

Table 11. Individual characteristics in 2002[1,2] (Wave III nominations)

Characteristic	
% females	49.46
Mean Age	20.61
% cohabiting	19.15
% married	7.25
% African American	12.80
% with college education	50.41
Mean Religiosity (7-category scale)	2.19
Mean Beauty (5-category scale)	3.56

[1] Individuals with non missing own and peers' relationship history

[2] Corrected for survey design

We repeat the analysis using only the friends that the respondents have identified as current ones and the results do not change much (Table 12).

[7] These respondents belonged to the youngest cohort of Wave I, this is why their average age and the % married is lower than those of all the respondents.

Table 12. Determinants of transition into marriage (Current friends)

	(1)	(2)
Specification	2SLS	Linear Prob/FE
Definition of Peers	Current friends	Current friends
% married peers	0.154**	0.040*
% cohabiting peers	-0.011	0.020
Individual characteristics	Yes	age, education
Parental characteristics	Yes	No
Births and rel. duration	No	Yes
Contextual characteristics	Used as instruments	age, education
No of person-years	6,543	6,543
R^2	-	0.047
F statistic	7.46; 6.12	-
J statistic p value	0.875	-

*** p<0.01, ** p<0.05, * p<0.1 (robust s.e. clustered at school level), cross sectional weights used
Individual characteristics: gender, age, education, race, religiosity, beauty; Parental characteristics: marital status at Wave I, mother's education, mother's age at marriage; Year dummies included

6 Robustness

At this point one may think that it is natural to find a positive correlation among individuals that went to the same school and share many common characteristic and thus may doubt about the causality of the peer effect. In order to convince the reader, we perform robustness checks using different groups of peers, namely ghost and placebo friends.

6.1 Ghost friends

There are respondents who indicated that had been previously friends (but not anymore) with some of the 10 listed names. Moreover, we have information on the month and year that the respondent last saw the former friend in person, talked with her on the telephone, or exchanged email. We can thus consider the effect of ghost friends, i.e. the effect of former friends in the years after the friendship has ended. As

we were expecting the percentage of married ghost friends does not have any significant effect on the transition of individuals into marriage (Table 9). This robustness check is supportive of our results using current friends as the peer group of reference.

Table 13. Determinants of transition into marriage (Ghost friends)

	(1)	(2)
Specification	2SLS	Linear Prob/FE
Definition of Peers	Former friends	Former friends
% married peers	-0.012	0.058
% cohabiting peers	0.021	-0.002
Individual characteristics	Yes	age, education
Parental characteristics	Yes	No
Births and rel. duration	No	Yes
Contextual characteristics	Used as instruments	age, education
No of person-years	2,712	2,720
R^2	-	0.070
F statistic	2.82; 5.13	-
J statistic p value	0.622	-

*** p<0.01, ** p<0.05, * p<0.1 (robust s.e. clustered at school level), cross sectional weights used
Individual characteristics: gender, age, education, race, religiosity, beauty; Parental characteristics: marital status at Wave I, mother's education, mother's age at marriage; Year dummies included

6.2 Placebo friends

A further robustness check consists of using placebo friends as the peer group of reference. Remember that in Wave III an algorithm, based on clubs and activities from previous data, was used to select 10 names of students who also attended the same school. In certain cases the respondents indicated that they did not know some of the 10 names. We define these unidentified friends as placebo friends. The placebo friends could have been potentially friends with the respondent given that the 10 names were not random, but the algorithm selected them among students of the same school who were doing similar activities with the respondent. Table 14 demonstrates that the characteristics of placebo and real friends are similar.

Table 14. Real VS placebo friends' characteristics in 2002[1,2]

Characteristic	Real friends	Placebo friends
% married	8.40	9.71
% females	54.44	60.53
Mean Age	20.63	20.72
% African American	15.94	19.49
% with college education	55.33	47.27
Religiosity (5-category scale)	2.28	2.09
Beauty (5-category scale)	3.58	3.55

[1] Individuals with non missing relationship history

[2] Corrected for survey design

Not surprisingly, placebo friends do not have a significant effect either (Table 15). It is thus actual peers, and not just students from the same school that do matter.

Table 15. Determinants of transition into marriage (Placebo friends)

	(1)	(2)
Specification	2SLS	Linear Prob/FE
Definition of Peers	Placebo friends	Placebo friends
% married peers	-0.026	-0.001
% cohabiting peers	0.042	0.019
Individual characteristics	Yes	age, education
Parental characteristics	Yes	No
Births and rel. duration	No	Yes
Contextual characteristics	Used as instruments	age, education
No of person-years	5,552	5,568
R^2	-	0.045
F statistic	5.50; 8.02	-
J statistic p value	0.632	-

*** p<0.01, ** p<0.05, * p<0.1 (robust s.e. clustered at school level), cross sectional weights used Individual characteristics: gender, age, education, race, religiosity, beauty; Parental characteristics: marital status at Wave I, mother's education, mother's age at marriage; Year dummies included

6.3 Friends that enter marriage/cohabitation after the respondent

The last robustness check concerns the timing of the transition into marriage. As we saw in Table 9, if any peer got married the year before, this affects the transition of the respondent into marriage in the current year. However, we expect that if any peer gets married the year after should not have any effect on the transition of the respondent into marriage in the current year. Indeed, this is the case (Table 16).

Table 16. Determinants of the timing of the transition into marriage
(Friends that enter marriage/cohabitation after the respondent)

Specification	Linear Prob/FE
Definition of Peers	Nominated friends
Any peer enters marriage next year	0.005
Any peer enters cohabitation next year	-0.005
Individual characteristics	age, education
Parental characteristics	No
Births and rel. duration	Yes
Contextual characteristics	age, education
No of person-years	13,839
R^2	0.091

*** p<0.01, ** p<0.05, * p<0.1 (robust s.e. clustered at school level), cross sectional weights used
Individual characteristics: gender, age, education, race, religiosity, beauty; Parental characteristics: marital status at Wave I, mother's education, mother's age at marriage; Year dummies included

7 Conclusions

The analysis shows a positive and significant peer effect on the transition of singles to marriage. There does not seem to exist a peer effect on the transition into cohabitation. Increasing the proportion of married peers by 10% leads to an increase in individual's propensity to get married on the order of 0.5-1.5 percentage points. The effect is larger for girls than for boys, religious and white people. The fact that there is no significant effect of ghost and placebo friends indicates that real peers do

matter. This social multiplier has to be taken into account when analyzing the effect of family-friendly policies, tax reforms, divorce laws or other policies that may affect the incentives to get married.

8 References

Adamopoulou, E. (2010). "Will You "Quasi-marry" Me? The Rise of Cohabitation and Decline of Marriages", *Economics Working Papers 1026*, Universidad Carlos III.

Becker, G. (1993). "*Treatise on the Family*", Harvard University Press.

Billari, F., B. Aparicio Diaz, T. Fent, and A. Prskawetz (2007). "The "Wedding-Ring", *Demographic Research*, Vol. 17, 59-82.

Blume, L., W., Brock, S., Durlauf, and Y., Ioannides (2011). "Identification of Social Interactions", *Handbook of Social Economics*, Vol. 1B, 853-964.

Bumpass, L., and H. Lu (2000). "Trends in Cohabitation and Implications for Children's Family Contexts in the US", Population Studies, Vol. 54,

29-41.

Calvó-Armengol, A., and Jackson M.O. (2004). "The Effects of Social Networks on Employment and Inequality", *American Economic Review*, Vol. 94, 426–454.

Calvó-Armengol, A., E. Patacchini, and Y. Zenou. (2009). "Peer Effects and Social Networks in Education", *Review of Economic Studies* , Vol. 76, 1239–1267.

Cappellari, L., and K. Tatsiramos (2010). "Friends' Networks and Transitions into Employment", *IZA Discussion Paper.*

Ciliberto, F., A., Miller, H., Nielsen, and M., Simonsen (2010). Playing the Fertility Game at Work, *Mimeo.*

Cohen-Cole, E., and J. Fletcher (2008). "Is Obesity Contagious? Social Networks vs. Environmental Factors in the Obesity Epidemic," *Journal of Health Economics*, Vol. 27, 1382-1387.

Drewianka, S. (1999). "Social Effects in Marriage Markets: Theory, Existence, Magnidute 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*, Vol. 85, 409-423.

Fletcher, J. (2010). "Social Interactions and Smoking: Evidence Using Multiple Student Cohorts, Instrumental Variables, and School Fixed Effects," *Health Economics*, Vol. 19, 466-484.

Fletcher, J. (2011). "Peer Influences on Adolescent Alcohol Consumption: Evidence Using an Instrumental Variables/Fixed Effect Approach", *Journal of Population Economics*, forthcoming.

Gaviria, A., and S. Raphael. (2001) "School-Based Peer Effects and Juvenile Behavior", *Review of Economics and Statistics*, Vol. 83, 257-268.

Greenwood, J., and N. Guner (2009). "Marriage and Divorce since World War II: Analyzing the Role of Technological Progress on the Formation of Households", NBER Macroeconomics Annual 2008, Vol. 23, 231-276.

Hensvik L. & P. Nillson (2010). "Businesses, Buddies, and Babies: Social Ties and Fertility at Work", *IFAU Working Paper*

Jackson, M. (2008). *Social and Economic Networks*, Princeton University Press.

Kalmjin, M. (2007). "Explaining Cross-National Differences in Marriage, Cohabitation, and Divorce in Europe, 1990-2000", Population Studies, Vol 61, 243-263.

Kuziemko I. (2006). "Is Having Babies Contagious? Estimating Fertility Peer Effects Between Siblings", *Mimeo,* Harvard University.

Leturcq, M. (2009). "Would you civil union me ? Civil Unions and taxes in France : Did the reform of income taxation raise the rate of civil unions ?" *PSE Working Paper 2009 - 17.*

Manski, C. F. (1993). "Identification of Endogenous Effects: The Reflection Problem", *Review of Economic Studies*, Vol. 60, 531-542.

McDermott, R., J. Folwer, and N. Christakis. (2009). "Breaking Up is Hard to Do, Unless Everyone Else is Doing it Too: Social Networks Effects on Divorce in a Longitudinal Sample Followed for 32 Years." *SSRN Working Paper.*

Patacchini E., and Y. Zenou (forthcoming). "Juvenile Delinquency and Conformism", *Journal of Law, Economics, and Organization*, forthcoming.

Raley, R., and C., Muller (2007). "Of Sex and Romance: Late Adolescent Relationships and Young Adult Union Formation", *Journal of Marriage and*

Family, Vol. 69, 1210-1226.

Xie, Y., J., Raymo, K., Goyette, and A., Thornton (2003). "Economic Potential and Entry into Marriage and Cohabitation", *Demography*, Vol. 40, 351-367.

9 Appendix

Variable	Type	Values
Gender	binary	0 if male 1 if female
Age	continuous	[18, 28]
Race	binary	0 if not African American 1 if African American
Education	binary	0 if high school or less 1 if more than high school
Religiosity	ordinal	0 never 1 a few times 2 several times 3 once a month 4 2 or 3 times a month 5 once a week 6 more than once a week
Beauty	ordinal	1 very unattractive 2 unattractive 3 about average 4 attractive 5 very attractive
Contextual		average peer characteristics
Parental marital status	binary	0 if parents were married in wave I 1 otherwise

Mother's education	binary	$\begin{cases} 0 \text{ if high school or less} \\ 1 \text{ if more than high school} \end{cases}$
Mother's age at marriage	continuous	[13, 53]
Out of wedlock births	binary	$\begin{cases} 1 \text{ if birth before the 9th month of marriage} \\ 0 \text{ otherwise} \end{cases}$
Relationship duration	continuous	in months