Marriage Market Signals and Homeownership for the Never Married[*]

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Abstract

There is a growing trend of buying homes among the single population in the U.S. This trend has been referred to as "Going Solo" and is particularly evident among women who are the focus of our study. In this paper we investigate the hypothesis that homeownership probabilities can be affected by marriage market expectations and pessimistic marriage market expectations may raise home buying probabilities among never married singles. We focus solely on the sub population called the never married single females and our results provide evidence consistent with the above hypothesis. In particular, we find that up to a certain threshold, the probability of homeownership decreases when the marriage market prospect indicator improves and there is evidence of heterogeneity in this relationship across race, education level, age group and motherhood status.

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1　Introduction

Several factors affect the decision to own a home and there is a wide literature that highlights these factors. In this paper, we explore a factor that could affect homeownership among a growing segment of the population-the never married. There is a growing trend of buying homes among the single population in the U.S. Klinenberg (2013) referred to this trend as "Going Solo" . This increase in homeownership among singles is particularly evident among women who are the focus of our study.[1] One possible explanation for this change is that more women are getting financially savvy and realizing that homeownership is crucial for their future wealth accumulation and are choosing to buy homes while they are single and are no longer waiting to get married to realize their homeownership dream(New York Times Aug 1, 2013).[2] While several other economic factors may partly explain this growing trend among single women, we propose an additional explanation for this trend. In particular we propose that the decision to buy a home is also influenced by prospects and expectations in the marriage market. Based on this thesis, we explore the dynamics between the marriage market and the housing market for never married single females. The rationale for our focus on the never married single female versus all single females is that the decision making process about home buying or ownership for a person who has lost a spouse and is now single or one who is divorced may differ significantly from individuals who have never been married even though they all share a single status.

The literature on homeownership is vast but research focused solely on females is limited despite a significant wealth gender gap (Sedo and Kassoudji 2004). One possible reason for the scant literature on female homeownership is data. In particular, the measurement of assets like homeownership are often reported at the household level and disentangling asset ownership for men and women who are married

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[1]*In a Barbie World: The Rise of Single Women* Jed Kolko,of Trulia refers to his subject as Barbie: "a young [25-34], single woman [with no kids] who lives in a [single-family detached] house she owns." Surprisingly, in 1960 (when the Barbie doll was introduced) only 0.1 percent of American women were living like Barbie (as defined above by Kolko). By 2011, that number of women increased by 15 times (see Koklo, 2013 for more details.

[2]It is important to mention that cohabitation is on the rise in the U.S. According to Census data there has been an over 100%increase from 1990-2010. Hence, some of the women we focus on in our research though single could be in cohabiting relationships. In this paper we do not identify cohabiting singles as a separate group so when we say single we are referring to not being married versus not having a partner.

is difficult. For singles however, focusing on either female or male homeownership is currently feasible but was not possible until recently. In the past, the never married was only a small percentage of the population in the 18-65 age group and an insignificant part of a typically data sample. This sample size limitations made studies focused on single males, or females or the gender homeownership gap, largely infeasible. However, in the last 14 years, the share of the single population above 18 has risen significantly making this kind of analysis possible.[3]

Homeownership which has become synonymous with the American dream was on the rise up until 2005 but has declined across the population since the recession. Despite this recent decline over a longer time horizon, women's homeownership has been rising. In particular, over the last 30 years women's homeownership rates have significantly increased from about 10 percent in 1980 to a new long term average of 20 percent. According to the National Association of Realtors, single women accounted for 16 percent of home buyers in 2012 and were well ahead of single men, who accounted for only 9 percent. Also according to the U.S census data, single women have outnumbered single men in homeownership every year since 1982 (Haberie, 2013). While several possible explanations have been suggested for this puzzling trend including the "going solo" phenomenon highlighted above and active homeownership marketing to females, concrete research attempting to explain this trend is scant. In this paper we do not attempt to directly explain this rising trend in homeownership among single females or why single women may have outnumbered single men in homeownership. Rather, we provide a possible additional explanation for why more single women are buying homes by shedding light on the possible link between the local marriage market and the housing market. In particular we propose that the decision to buy a home for a single women can be influenced by her perceived prospects and expectations in the marriage market.

First, we provide a basic conceptual framework that highlights why a link between homeownership and marriage market prospects is plausible and this framework leads to a testable hypothesis and the specific questions we address. In particular, we explore whether women take into account marriage market

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[3]Geiger and Livingston (2018) provide one explanation for this increase in singles delay in their first marriage. They state that 2017 data from the U.S. Census Bureau, shows that the median age at first marriage is now 29.5 for men and 27.4 for women which is the highest on record.

prospects in their home buying decision. We test the hypotheses that lower marriage market prospects leads to increase homeownership. We also investigate whether the impact of marriage market prospects on home buying decision exhibits nonlinearities and differs based on education and ethnicity. Finally, we consider whether age plays a role in home-buying responsiveness to marriage market signals for never married single women.

Our basic methodology for testing this hypothesis and investigating the aforementioned questions is focused on estimating a reduced form model of homeownership. We control for relevant factors that predict homeownership and test for possible impacts of the marriage market on single women's homeownership decisions. Specifically, our key variables of interest are our measures of marriage market prospects: lagged female and male marriage rates in a woman's age cohort in her state of residence the previous year. In order to control the relative supply of men and women in the state, we also control for the sex ratios in a woman's state of residence.

We test our proposed hypotheses using the single never married sample from the Current Population Survey (CPS) for the U.S. over the years 2000 - 2013. As earlier noted, we focus on never married women in our study as divorced and widowed women are quite different from those who are never married and homeownership for divorced and widowed women may be explained through alternative channels.

Our results providence evidence consistent with our hypotheses. As marriage market prospects increase (we measure these prospects using one year lagged marriage rates), single women reduce home purchase. We hypothesize that they make this choice because they believe their own chances of getting married are higher when marriage prospects are higher for their age group in their state. Hence it is optimal to postpone home purchase and make a home buying decision jointly with a spouse. In contrast, as marriage market prospects declines, never married women increase home buying and this is one plausible explanation of the "going solo" phenomena. In addition, we find evidence of nonlinearities in this relationship between marriage rates and homeownership. We also find evidence of heterogeneity in the effect of marriage market prospect on homeownership across ethnicity, education level, age group and motherhood status.

Our paper contributes to the literature by examining the relationship between marriage market expectations or prospects and homeownership at the state level for women in the U.S. While there is a growing literature on the marriage market and an extensive literature on homeownership, literature examining the interrelationship between homeownership and the marriage market is limited. This paper aims to fill this gap. Our paper will also draw attention to the heterogeneity in the relationship between marriage market prospects and homeownership across education levels, race, age and motherhood status- which is important for targeting policy initiatives. Finally, given the rise in the single population in the U.S. and the increase in wealth inequality over time in the U.S., examining homeownership for this growing subpopulation is not only important but timely and has important implications for drivers of housing demand and wealth creation.

2 General Background/Conceptual Framework

Home buying is a long term investment decision and traditionally signals settling down and starting a family. The decision to get married, which in the past typically came before home purchase, is linked to many factors including an individual's prospects in the dating/marriage market, and the probability of finding a mate(See Lichter, LeClere, and McLaughlin (1991), Lichter, Anderson and Hayward (1995) and Blau, Kahn and Waldfogel (2000), Fisman et al (2006) on factors affecting marriage and mate selection decisions.) Hence an indirect link exists between individual home buying and own marriage market prospects.

In this paper, we propose that the decision to buy a home for a single women is influenced by her perceived expectations and prospects in the marriage market. [4] In particular, we explore the role of marriage market prospects (potential of getting married) on single women's homeownership in the U.S. We propose that women may often decide to go solo in this investment decision of buying a home if they perceive that the marriage market does not appear promising for them. This will hold strongly for women with steady jobs and income and who qualify for home loans on their own without a partner's joint income.

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[4]Our modelling of marriage market for single women is focused on heterosexual relationships. Same sex marriage became legal in all states in the U.S in 2015. Given the data period we consider is 2000-2013, this focus is reasonable.

This group of women are more likely going to make the decision to "go solo" and buy a home if marriage prospects are low. There are several potential reasons why women may believe that market prospects are low or all *good men* or potential matches are already taken.[5] For example Birgers(2015) suggests that there is a deficit of men and a shortage of college-educated men, which is not restricted to big-city but is seen all over the nation-there are four women for every three men.

Past research suggests that age plays a role in marriage market prospects. According to research from the Pew Research Center in 2014, the odds of getting married for the first time after age 54 is relatively small. The decrease in the probability of marriage as individuals get older is more pronounced for women than men since men on average marry women 3-5 years younger than they are (Knox 2016; Bhaskar 2013). Given the importance of age we posit that single women in older age cohorts will have lower marriage prospects and are more likely to invest in homeownership on their own. This hypothesis is consistent with recent trends. In particular, Harberie (2013) notes that the only age group where single men outpace single women in home buying are the less than 35 age group. For age cohorts above 35, single women outpace men. Moreover, the age cohort, among women, which has experienced the most growth in homeownership, over 120% increase, in the last three decades is the 45 to 54 age group.

It is important to mention that while we are assuming single women want to be married and the likelihood they get matched depends on market prospects, there are alternative views suggesting that matching is not the reason behind the rise in the unmarried population, but rather women are making a choice to stay single.[6] While we acknowledge that part of the growth in the never married female population is choice driven there is data evidence that most people want to get married. For example Newport and Wilke (2013) suggest there is little widespread attitudinal aversion to first-time marriage. In particular using data from the Gallup poll they show that only 5% of the population have never been

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[5]Reasons include, information, male deficit, age, motherhood status and how active the local marriage market where they live is, for their age cohort.

[6]As Rebecca Traister writes in "All the Single Ladies", on the rise of single women in America, women are waiting longer to wed than ever, and many are choosing not to do so at all. The freedom to pursue high-powered careers and sexually diverse lives without fear of pregnancy or stigma has turned marriage into a choice, not destiny. By 2009 nearly half of all American adults younger than 34 had never married, a rise of 12 percentage points in less than a decade. Unmarried women outnumber married ones for the first time ever. Economist, April 16, 2016.

married and do not want to get married. Even among those who are 18-34 years a population which has been characterized as not being interested in marriage, only 9% fall into this category. For those 35-54 age group only 3% have never been married and do not want to get married and for those 55 and above this is only 4%. In the section that follows we present a theoretical framework based on the implicit assumption that women want to get married, the above discussions and data suggest that this model assumption is reasonable.

3 Theoretical Framework

In this section we highlight a simple reduced form framework that captures the hypothesis we test in this paper. In setting up this framework, we make some assumptions that are consistent with past attitudes and norms.

- We assume that single women prefer marriage over never getting married.

- We assume couples have a preference for buying a home together with their spouse after marriage rather than buying a home on their own, or moving into a home either previously own.

Given these assumptions, consider a single woman i who is deciding whether to buy a home in period t or wait till period $t+1$ or future periods and make a joint decision of buying a home with her husband.[7] Lets assume her demand for homeownership in period t is represented by

$$H_{it} = f(EM_{it+1}, X_{it})$$

where H_{it} is whether single woman i buys a home or not and EM_{it+1} is the expected marital outcome for a single woman i in period $t+1$ and X_{it} is a vector of her characteristics such as age, education, race, risk aversion as well as financial institutions and other local characteristics.

Given her beliefs the individual i assigns a probability ϕ_{it+1} that she will get married in year $t+1$. So her expected marital outcome in period $t+1$ is $[\phi_{it+1}.M] + [(1-\phi_{it+1}).S]$, where M stands for married

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[7]As mentioned in the section above we are also restricting our model to heterosexual relationships.

and S stands for single. The probability that a single woman places on the likelihood that she will get married in period $t + 1$ is given as follows:

$$\phi_{it+1} = f(G, J_{s,agrp,t})$$

where G captures all other factors that affect the probability of getting married. For example the institution and the marriage market set up including the strength of the desire to get married and how pro active the single woman is in looking for a husband. For simplicity we assume these factors are constant. On the other hand, $J_{s,agrp,t}$ captures the pool of eligible men in an individual's age group (agrp) in state (s) in period (t). For a typical single individual, ϕ is an increasing function of $J_{s,agrp,t}$ (the pool of eligible mates). Assuming G is constant, when a single woman i perceives a low J she assigns a low ϕ in period $t+1$. If we consider the simple case where she assigns a low $\phi = 0$. In this scenario $EM_{it+1} = S$. This means that when a single woman perceives that the pool of eligible males is low, she places a very low probability (zero) on her chances of getting married in period t+1. Hence her optimal response in period t will be to buy a home (assuming $\phi_{i,t+j} \leq \phi_{i,t+1}$ where $j \geq 2$). [8]

We can sum up our simple framework as follows. For the never married female, a poor pool of prospective males today, signals low marriage prospects tomorrow and in future periods, assuming pool of potential/ prospective or interested males only gets smaller over time for a woman as she gets older. This assumption is consistent with some of the literature noted above suggesting much lower probabilities for those above 50 (Knox 2016; Bhaskar 2013). Given this low prospects, the optimal response of the never married single woman holding all other factors constant, is to buy a home today and not postpone since the chances of making a joint decision with a spouse to buy a home in future periods is low in period t and in the future periods. In contrast, if a never married female perceives a good pool of eligible males today, she knows her chances of marriage in period t and subsequent periods is high. Since home purchase

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[8]We are ruling out the possibility that the single woman will buy a home to increase her prospects in the marriage market. This is a reasonable assumption in the country context we are focused on. Past literature on the U.S suggests that women consider mens' current and future earning potential, education, job stability, status and other economic factors in choosing a marriageable mate (see Xie et al. (2003) and Wu and Polland 2000). In contrast, men consider factors such as attractiveness, female fecundity and similar socioeconomic background (see Buss,1994 and Fishman et al , 2006). Owning assets like a home is not a factor that has been noted in the past literature as important for males in their mate selection.

is a big decision made by married households jointly, she would make the optimal decision of not buying a home in period t but instead buy in period $t+1$ or future periods as a joint decision with her husband.

There are several ways an active and positive marriage market prospects can be measured. In this paper we measure these prospects using the signal of lagged marriage rates in an individual's age group and vicinity (state). Hence, higher male marriage rates signal an active marriage market, which indicates that there must be a good pool of prospective males and hence the marriage market expectations and prospects of never married singles are high. However, higher male marriage rates beyond a certain threshold could also signal that the pool of eligible males is depleted and the only males left are those who were not chosen and are a poor match for individual i. Given our choice of proxy variable for own marriage market expectation, possible heterogeneity in its effect on home buying decisions could exist across race, age group, education level and motherhood status. Our rational for assuming possible heterogeneity across race and education level is based on recent research by Mundra and Uwaifo Oyelere (2018) suggesting that the factors that determine homeownership among singles exhibit heterogeneity across race and education level. Similarly, the marriage market and mate selection literature suggests differences in marriage market prospects across race, education levels and motherhood status (see Qian et al 2005, Litcher 1991 and Adams, 2015)[9] Based on our simple framework we propose three hypothesis which we test in our empirical section. First, there is a negative relationship between homeownership probability and signals of marriage market expectations and prospects. Second, the relationship between homeownership and marriage rates (our signal of marriage market prospect) exhibits nonlinearities. In particular, based on our model it should be decreasing with marriage market rates up to a certain level and then increasing with marriage market rates beyond certain levels (U-shaped relationship). Finally, the relationship between homeownership and marriage market signals exhibits heterogeneity across race, age, education level and motherhood status. We would expect that more educated and older women will pay less attention to the marriage market signal when making homebuying choices and this relationship will further weaken if the never married single women is a mother.

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[9]Motherhood status is used to describe whether a single women has one or more children.

4 Relevant Literature

Marriage provides an individual more resources and financial stability which leads to higher homeowner-ship.[10] Married people also tend to settle down and are geographically stable leading to higher homeown-ership rate than their unmarried counterparts. The literature also recognizes that there are inter-linkages between the type of household and homeownership. Haurin and Rosenthal (2007) look at the effect of household formation on homeownership and how the differences in headship ratios across age and race of headship ratios affect homeownership rates. Using Australian data Hendershott et al. (2009) show that married individuals have more resources than the single individuals and divorce leads to a loss of resources, hence divorced individuals have lower homeownership rates than married individuals.

There is some new literature exploring the role of marriage market on the housing market. Housing in this framework is treated not only as a consumption good and as an asset, but as a status symbol. Owning a home makes a man more attractive in the marriage market and potentially a better suitor. This holds in many societies, but is especially common is countries like China where hypergamy (marrying a person of higher social status) is common.[11] Exploring this hypothesis, Wei et al.(2012) for China finds that Chinese men face a highly competitive marriage market due to adverse sex ratios and buying a property enables them to distinguish themselves in the marriage market thus driving home prices up, especially in urban China. In particular, they find that given homeownership signals higher status and marriageability, a rise in the sex ratio accounts for 30 - 48% of the rise in real urban housing prices in China.

Similar to buying homes there is evidence of men spending on conspicuous consumption as a signal of higher income to attract partners in the marriage market (Ireland 2001; Glazer and Konrad 1996; Moav and Neeman to name a few). Evolutional psychology literature also provides ample evidence that men and not women use costly signals - such as home buying or other luxury consumption to display their wealth and income potential to show that they can support their offsprings. Common convention is

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[10]According to Becker's theory of marriage Becker (1974), individuals marry for economic resources or for division of labor. In contrast in Edward's theory of marriage there is an exchange of both economic and non-economic goods. In either theories marriage leads to more resources for the individual facilitating home buying.

[11]China's Marriage Market: The Hypergamous Chinese, July 14th 2013, The Economist.

that men on the other hand are looking for beauty in their potential mates and the joint production of offsprings is an important purpose of marriage for them (Edlund 2006). Obviously men put more weight on women's beauty and according to Becker would choose partners who could manage the household and raise children, whereas women favor men who are intelligent and grew up in wealthier neighborhoods and prefer men who have a good earning potential. [12]

For the reasons noted above women do not focus on buying homes or conspicuous consumption to make them more attractive in the mating and marriage market. Also past experimental economics research provides evidence that women unlike men in mating mindset are more prone to indulge in conspicuous benevolence rather than conspicuous consumption or home buying (Janssens et al. 2011 and Griskevicius et al. 2014). Both from the traditional marriage market and social context, the motives for getting married may be changing for women in the U.S. The demographic shift towards more women with higher education and careers outside the home, as well as increased cohabitation instead of getting married has slowly but steadily reversed the traditional motives for getting married among women in the U.S. Today, many women in the U.S. are simply not looking for high income potential in their mate but are rather searching for a compatible domestic partner who can support the women in her career and effectively participate in a joint division of labor of both home and market production.

The past literature some of which is highlighted above is focused more on household formation and dissolution and an individual's homeownership choice. Papers considering possible links between the expectation of getting married and an individual's future homeownership are scant. Our paper aims to fill this gap.

5   Data and Descriptive Statistics

Our sample is derived from the CPS, which is a microdata set that provides detailed information about individuals and households. The CPS is a monthly U.S. household survey conducted jointly by the U.S. Census Bureau and the Bureau of Labor Statistics. We specifically make use of the March CPS which

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[12]For a survey from evolutionary perspective on consumption to attain a status and keep a mate see Griskevicius and Kenrick (2013) and for gender differences in pro-social behavior see Pan and Houser (2011).

contains the Annual Demographic File and Income Supplement. We derive multi-stage stratified samples of the March CPS from Integrated Public use Microdata Series (IPUMS). IPUMS-CPS is an integrated set of data covering 55 years years (1962-2017) of the March CPS. However we only make use of data from 2000-2013. Our choice of this period is linked first with the significant increase in singles during the last decade. Moreover, we are also interested in how the recession affects homeownership for singles. Hence the need to restricting our period of analysis to a reasonable expanse of time before and after the recession.[13] In addition our paper only focuses on the marriage market between heterosexual couples so a focus on a period before the legalization of marriage for homosexual couples is preferred given recent data does not identify these two types of marriages.

Table 1 provides summary statistics for the key variables in our regression model. In column (1) we summarize information for all never married singles (male or female). In columns (2) and (3) we summarize information for never married singles- the sub-sample for our analysis. Column (2) provides summary statistics for those age 34 and less and in column (3) we provide statistics for never married females above 34. We divide single females into these two groups because we test for heterogeneity in response to marriage market signals across these age groups.

Figure 1 highlights the trends in the share of the U.S population that have never been married for males and females. This figure shows just as we alluded to earlier in the paper, that the share of those who are not married is on the increase in the U.S. Between 2000 and 2013 our evaluation period, there has been about a 4 percentage point increase in the share of never married women and about a 3.7 percentage point increase in the share of never married men. Figure 1 also shows that the share of never married men has historically been higher than never married women. In 2000 the gap in the share of never married males compared to females was about 5.1 percentage points. By 2013 the gap in this share has declined to about 4% which suggests that the share of never married females has been growing a little faster than

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[13]Given all monetary variables in IPUMS CPS are in nominal dollars and we make use of repeated cross sections over time, we adjust all monetary variables used in our analysis to constant 1999 dollars using CPI-U adjustment factor available in IPUMS (which corresponds to the 2000 CPS dollar amounts). Since the CPS makes use of a complex stratification sampling, we include personal weights for individual in our analysis.
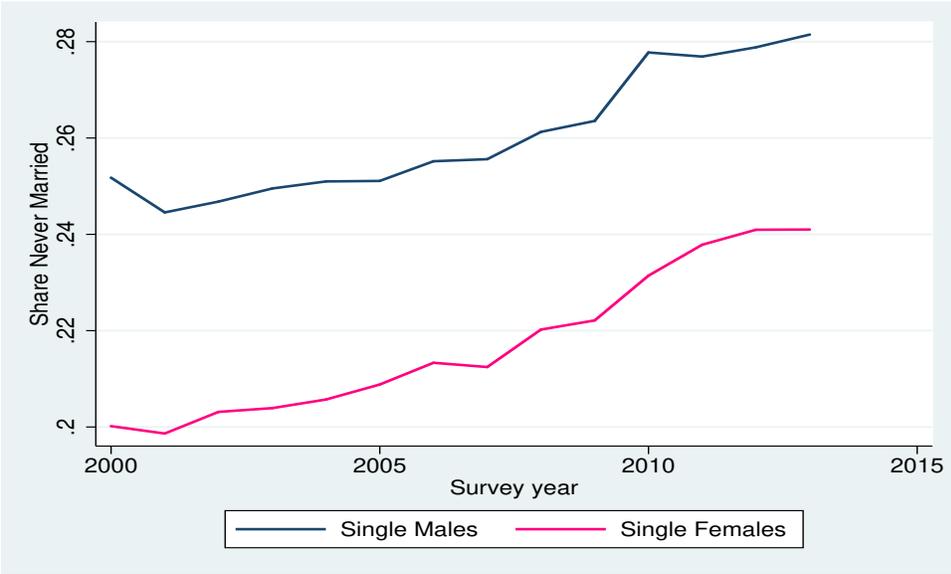
Figure 1: Trend in the Share of Males and Females who have never been married

the share of never married males.

In this paper we focus solely on never married females and figure two highlights the trend in their homeownership over time. We notice that homeownership increased during the housing boom and decline to slightly below 2000 levels of homeownership by 2013. This trend is not unique to never married females. Never married males also exhibited a similar trend (see Figure 3) although homeownership rates are higher. With rates of homeownership in 2000 at 57.76% rising to 62.23% in 2005 and falling back to 57.20% in 2013. A similar trend in homeownership was noted by Mundra and Uwaifo Oyelere (2018) among other groups such as those married and those divorced. Figure 3 also highlights the trends for the married which as expected and documented in the literature is much higher than the homeownership rates for the never married.

In this paper we are interested in identifying a possible link between marriage market signals and homeownership. Our conceptual framework suggests a negative relationship between marriage market prospects and home buying for the never married. We check for preliminary evidence in support of this hypothesis by plotting the median spline of mean homeownership on lagged male marriage rates, our
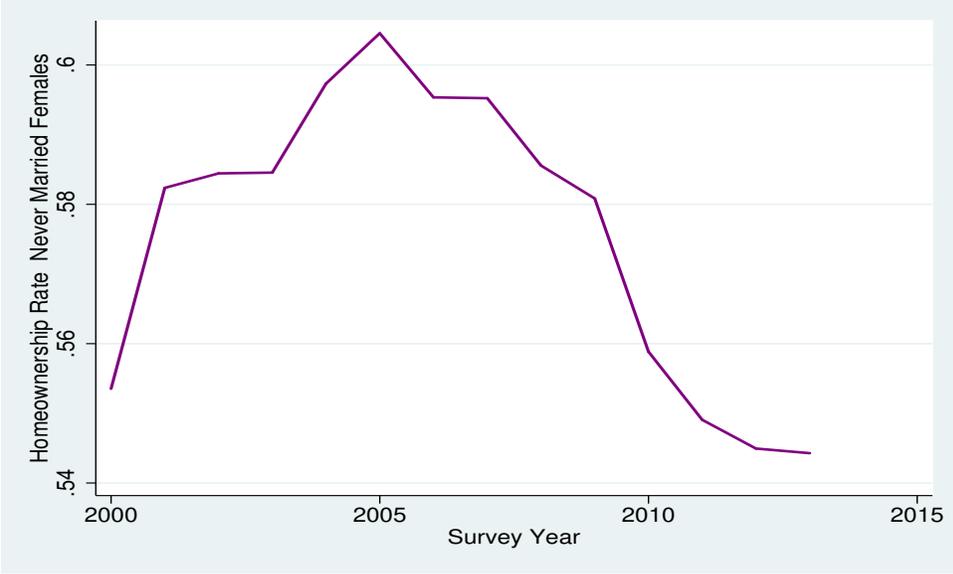
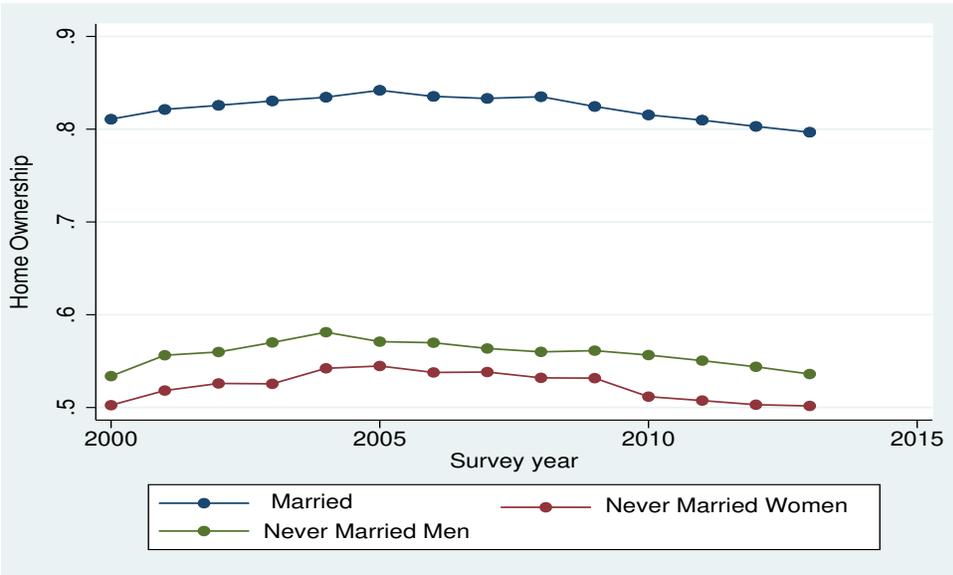Figure 2: Trends in the Never Married Female Homeownership Rate

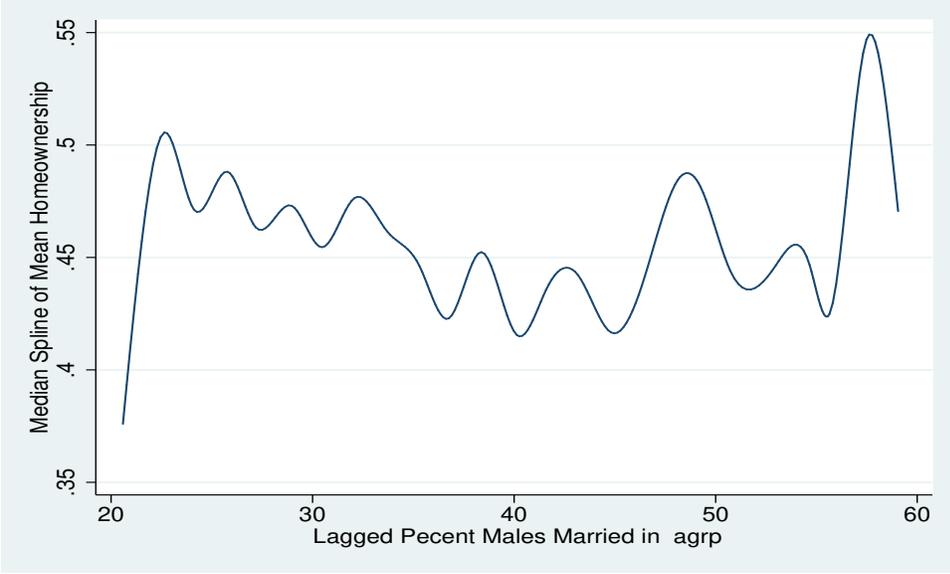Figure 3: Trends in Homeownership Rates

Figure 4: Homeownership Rates and Male Marriage Rates

proxy for marriage market prospects (see figure 4).[14] This figure provides some evidence of a negative

relationship between never married women's homeownership rates and lagged male marriage rates up until

about 45%. Beyond 45% male marriage rates, the relationship becomes positive.[15] This figure suggests

a nonlinear u-shaped relationship between our proxy variable and homeownership. We test for this by

introducing a quadratic term in our empirical model.

6 Empirical Strategy and Results

To test the hypothesis that homeownership probabilities are affected by marriage market signals, we

estimate the following probit model (equation 1) and derive the marginal effects for our variables of

interest.

$$Pr(O_i = 1) = \mathbf{X}_i'\alpha + \beta_1 MaleMarriageRates_{s,t} + \delta_s + \gamma_t + \varepsilon_i$$

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[14]In making figure 4 we drop the tail values of lagged male marriage rates.

[15]Though the relationship between male marriage rates and homeownership in Figure 4 is noisy, a downward trend up until 45% is visible.

Where O_i is the decision to own a home by the individual i and takes the value of 1 if an individual owns a home and 0 otherwise. Vector X captures individual controls that are important in the home buying process or the decision to own a home. These variables are those which prior literature suggests are important determinants of homeownership. The vector X includes educational attainment, age, income, proxy for savings (interest income), number of children, employment status, race, and citizenship status. We also include a dummy for the recession and afterwards period. This dummy takes the value 1 for the years 2007-2012 and 0 otherwise.[16] We break down race/ethnic groups as follows: white (Non Hispanic), Black, Hispanic, Asian, Native American, and Mixed Race. [17] We divide the sample into employed, not in the labor force (NILF), NILF with Disability and unemployed. For citizenship status we include three groups: naturalized citizen, not a citizen and native. Gender is a dummy that takes value 1 for female head of the household and 0 for male. We include total real income of the households and total real interest income in vector X to control for household savings and home buying potential. We convert nominal income and interest rates into real values using the CPI. We also include in matrix X sex ratios in an individuals state and age group in year t to control for relative supply of men and women in the state. All our specifications include state fixed effects δ, year fixed effects γ, and metro area dummies. We report the marginal effects from the probit model.

Our variable of interest is the lagged male marriage rates in individual i's state and age group in year t.[18] Although, most people choose spouses from within their own ethnicity, we do not calculate within racial group lagged marriage rates. Our rationale for not doing this is the steady increase in intermarriage since 1967. Geiger and Livingston (2018) allude to this increase. They suggest using data from the PEW research center that 17% of newlyweds married someone of a different race or ethnicity in 2015. Given this trend, it is not implausible to assume that single females focus on general market trends versus submarket trends.[19] We control for potential nonlinearities in the relationship between the marriage market signal

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[16]The National Bureau of Statistics (NBER) states that the Great Recession lasted for 18 months from December 2007 - June 2009.

[17]The Hispanic group is restricted to white Hispanic and the mixed category includes all those who self-identify themselves as mixed race in the CPS.

[18]The relevant age groups are less than 20, 21-30, 31-40, 41-50 and above 50.

[19]If our assumption is wrong and single females only consider within racial group marriage market trends, then our

and the decision to buy a home by including a quadratic term for lagged male marriage rates. As a robustness check we will also explore the marriage market signal of lagged female marriage rates for individuals in a particular state and age group. If higher lagged male marriage rate is a signal of active marriage market for never married single women than seeing higher lagged female marriage rate in their age group should work in similar way, after controlling for sex ratio in the state.

7   Results

In Table 2 we present the results of our basic model. Keep in mind as noted above, that our model is focused solely on never married females. Column one summarizes the results of the model when we include in the model a lagged female marriage market signal while in column(2) we estimate the model making use of the lagged male marriage signal. The estimates of the control variables in Table 2 are consistent in sign with the expectations in a typical homeownership model. Meaning they take on the signs that are expected. For example we see a positive relationship with age, savings and income and a negative relationship with number of children We focus our attention on the marriage market signal variable and the quadratic term with respect to it.

Our result suggests a statistically significant negative relationship between our marriage market signals whether female or male and homeownership. This result is consistent with the expectation from our model. In particular, when more females or males in the age group of individual i are getting married, this signals that the marriage market for group i in state j at time t is active and the prospects of getting married are high. When more singles are getting married in the woman's age group in her state she is optimistic about her marriage prospects. Therefore, the never married female would postpone home buying hoping to get married soon and then make that significant financial decision with her husband.

Notice however, that the squared term for female and male lagged marriage rates are positive and significant suggesting a nonlinear relationship. In particular the negative sign on the lagged marriage rates and the positive sign on the lagged squared rates is consistent with the hypothesised u-shaped

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marriage market indicator would be more noisy biasing our results towards zero. Hence our estimates can be viewed as a lower bound on the estimated effects assuming no other biases.

relationship. It suggest that up to a certain threshold level, an increase in the share of married males or females in individual $i's$ age group and state would suggest positive marriage market prospects and lead to less home buying. However, beyond a certain point such signal would be interpreted differently. In particular the signal could be interpreted as the market is saturated and the chances of finding a good husband match may be low (the belief that every viable prospective male has already been taken). Assuming this scenario, it becomes optimal for individual i to just go ahead and buy a home -hence beyond a certain level the marriage market signal (male or female lagged marriage rates is interpreted differently) and homeownership probabilities for single women increase.

In Table 3 and Table 4 we explore the heterogeneity of marriage market prospects on homeownership across education and race, respectively. From Table 3 we see that for all education groups higher prospects of marriage lowers current homeownership. At all levels of education if more men and women are getting married at the individual's age group, it signals an active marriage market and the single female assigns a higher probability to her chance of getting married and postpones home buying. However, it is interesting to note that single women with college and graduate school postpone their homeownership decision with a higher probability than the group of women with less than high school education and the group with high school.

Estimating the effect of the lagged female and male marriage market rates on homeownership for single female across race we find that a higher marriage market prospects significantly lowers the homeownership for females of all races. Our finding suggests that single females in the U.S. regardless of race take marriage market conditions into consideration in their homeownership decisions. Interestingly, our preliminary results from Table 4 suggest that for White single females marriage market expectations have the largest effect on their home buying compared to other race/ethnic groups. We note the lowest effect among Hispanic females.

Age is an important factor in the marriage market, especially for single females. Older women are less inclined to take marriage market prospects into their home buying decision for several reasons including

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lower probability of finding a spouse as women age. We estimate our model across education and race for females below and above 35 years. Table 5 summarizes the results from 16 different regression estimations. We estimate our standard model for each education level, dividing singles into those below 35 and those 35 and above. In the regressions summarized in panel A2 and B2 of Table 5 we make use of the lagged male marriage rate and in panel A1 and B1 we estimate the model using the lagged female marriage rates. Our result suggests that younger women, under 35 years of age, for all education groups significantly lower their homeownership when they expect that the marriage market in their state is active and they are optimistic about their marriage market prospects - interpreted by both looking at the female marital rate or male marital rate in their state in their age group.

For women 35 years and above, our results are not fully consistent with the hypothesised relationship. In particular the lagged male marriage rate signal has insignificant effects on homeownership decision. In contrast, the lagged female marriage rates for singles with high school education and more are consistent with the hypothesis that single women take into account marriage market optimism. However, they only consider female marital rates in their age group in their state. For women 35 years and above with less than a high school education, lagged marriage rates for women and men have an insignificant effect on homeownership. One possible explanation for this difference in the effect of signal on homeownership for women above 35 is how women in this age group may be interpreting marriage rate signals. A single female over 35 who observes high marriage rates for other females above 35 may interpret this signal as there is still a good chance that she may get married since most other women got married. However, its no secret that women's chances of getting married drop significantly as they get older. This is because as past research has confirmed, men seek women who have the ability to bear children and this ability drops significantly for women above 35. Hence a single women above 35 observing a high percentage of men in her age group in her state married, may not view this information as a clear signal of her marriage prospects since men from her age group are more likely to match with women younger than 35. Women 35 and older choosing to ignore male marriage rates signals could be a possible explanation for

the insignificant effect noted in Table 5 panel B2. However, alternative explanations for these results are possible.

In Table 6 we estimate models similar to those summarized in Table 4 but in this case we estimate separately for each ethnic group those below 35 and those 35 years and above. Our rationale for doing this is to explore possible heterogeneity across race in how being below and above 35 affects responses to marriage market signals. Similar to the results summarized in Table 5 we find evidence consistent with the hypothesised relationship for singles under 35 years of age regardless of racial groups. Suggesting that single female below 35 perceive an active marriage market from both the female marital rate or male marital rate signals and significantly lower their current home buying. For single women above 35, there is significant heterogeneity across race. In particular, we note that Black single females above 35 do not respond to either male or female marriage market signals. Suggesting a lack of the hypothesised relationship for Black females above 35. In contrast we find some evidence of the hypothesized relationship among White females. In particular they respond solely to female marriage rates. For Asian single females above 35 we note no response to female marriage market signals but weak evidence in support of a response to male marriage rates (only significant at 10%). Support for a response to marriage market signals is also weak for Hispanic females 35 and above and the direction of the effects are not consistent with the hypothesised relationship. In particular, while significant effects are noted using male and female marriage rates the estimates are only significant at the 10% confidence level. Moreover, the sign of the coefficient is positive in Panel 2A and negative in Panel 2B. The noted heterogeneity in effect across race for single women 35 and above is note worthy and raises interesting questions that call for further investigation.

In Table 7 we estimate our model for single never married people by motherhood status. In particular we divide the never married females into those with at least one child and the group without any children. Our rationale for including this analysis is to check for differences in response to marriage market signals for those who have children versus those who do not. As noted much earlier in the paper, there is ample evidence suggesting that single women with children face significantly large barriers to marriage and lower

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marriage market prospects than those without children (Gibson-Davis et al, 2005 and Litcher et al, 2003). Hence, it is useful to check whether there is a differential effect in how single women with or without children views or interprets marriage market signals. As expected we find that marriage market prospects have a smaller effect on home-buying for single women with children than without any children. In particular while we find evidence of our hypothesized relationship for both groups -meaning both respond to the two marriage market signals measured by the lagged female marriage rate or male marriage rates, the magnitude of the effect for single women with children is about half of that for those without. This result suggests that single women after taking into account their disadvantage in the marriage market are less responsive to higher marriage rates with respect to postponing their home purchase. Also, there is a possibility that many single women with children are choosing to cohabit given their lower marriage market prospects. Cohabiting singles are more likely to buy homes and may not pay as close as attention to marriage market signals.

8   Conclusion

In this paper we propose and test three hypothesis using CPS data for the years 2000-2013. First, there is a negative relationship between homeownership probability and signals of marriage market prospects. Second, the relationship between homeownership and marriage rates (our signal of marriage market prospect) exhibits nonlinearities. Finally, the relationship between homeownership and marriage market signals exhibits heterogeneity across race, age group and education level.

Our results are largely consistent with these three hypotheses. In particular, we find that there is a negative relationship between marriage market prospects and homeownership. We however find evidence of nonlinearities in this relationship which suggests beyond a certain level, the relationship between male or female marriage rates and homeownership becomes positive. We also find evidence of heterogeneity in the effect of marriage market signals on homeownership across age group, race, education level and singles with or without a child. Single women above 35 and single women with children tend to respond less to marriage market signals. A possible explanation for this may be because these signals provides weak noisy

information on their marriage market prospects. However in our paper we are unable to identify if this is the exact explanation for the noted trend. Hence alternative explanation for our findings are plausible.

Our current research has some limitations that we hope to address through further research on this topic. In particular, our estimates may be downward biased due to potential omitted variables, simultaneity bias and possible noise in the measurement of marriage market prospect. We do not worry too much about these limitation in this paper because our primary focus is not the precision of our estimates but rather searching for empirical evidence consistent with hypothesized relationships between homeownership and marriage market prospects for single females. Our findings also raise further questions beyond the scope of this paper. In future research we hope to search for alternative signals for marriage market prospects. Our rationale being to check for consistency between our current results and alternative marriage market signals. In addition, we hope to gain more conceptual clarity for some of the differences in the test for heterogeneity when using female versus male marriage rates as a signal across race. Finally in future research, we will focus on getting identifiers for cohabitation. These identifiers will help us gain better understanding of the potential confounding effect of this group on the relationship hypothesised in this paper.

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Appendix

Table 1: Summary Statistics

	All Never Married (1)	34 and below Female (2)	≥ 35 Female (3)
Homeownership	0.589	0.509	0.647
	(0.492)	(0.499)	(0.478)
Lagged Male Marriage Rate	53.349	28.913	74.958
	(28.054)	(23.037)	(5.365)
Lagged Female Marriage rate	49.50282	34.192	62.117
	(23.026)	(24.523)	(8.93)
Age	41.182	24.161	58.171
	(19.56)	(4.803)	(15.207)
Age^2	2078.557	606.87	3615.15
	(1895.224)	(243.848)	(1838.05)
Sex Ratios	0.832	0.832	0.827
	(0.762)	(0.076)	(0.075)
number of children	0.343	0.4213	0.553
	(0.762)	(0.881)	(0.890)
Real Income Total	20962.94	13816.56	23251.39
	(28176.01)	(18301.09)	(27327.87)
Real interest Income	485.33	97.091	747.555
	(3276.973)	(1176.216)	(3927.86)
Yrs of education	12.98	13.262	12.85607
	(2.78)	(2.213)	(3.15)
White	0.602	0.561	0.626
	(0.489)	(0.496)	(0.484)
Black	0.167	0.173	0.194
	(0.373)	(0.379)	(0.395)
Hispanic	0.143	0.168	0.107
	(0.350)	(0.374)	(0.309)
Asian	0.049	0.056	0.041
	(0.216)	(0.230)	(0.199)
Native American	0.018	0.018	0.016
	(0.133)	(0.133)	(0.132)
Mixed	0.021	0.024	0.017
	(0.216)	(0.154)	(0.127)
Employed	0.590	0.647	0.493
	(0.492)	(0.478)	(0.500)
UnEmployed	0.060	0.068	0.032
	(0.238)	(0.252)	(0.175)
NILF	0.283	0.262	0.376
	(0.450)	(0.440)	(0.484)
NILF (cannot work)	0.067	0.023	0.104
	(0.250)	(0.150)	(0.306)
Native born	0.877	0.890	0.879
	(0.328)	(0.313)	(0.326)
Naturalized	0.046	0.030	0.067
	(0.210)	(0.171)	(0.251)
Not a citizen	0.076	0.080	0.053
	(0.266)	(0.271)	(0.225)
N	794310	180,950	261,903

Table 2: Do marriage market signals matter for homeownership for the Never Married?

Variables:	Active Female Marriage Market Signal (1)	Active Male Marriage Market Signal (2)
Recession dummy	0.0139	0.0151
	(0.009)	(0.010)
age	0.0071***	0.0010
	(0.001)	(0.001)
age^2	-0.0000**	0.0000
	(0.000)	(0.000)
Female marriage rates	-0.0089***	
	(0.000)	
Female marriage rates Sq.	0.0001***	
	(0.000)	
Male marriage rates		-0.0096***
		(0.000)
Male marriage rates Sq.		0.0001***
		(0.000)
Sex ratio	-0.0622	-0.0546
	(0.040)	(0.041)
Number of child	-0.0911***	-0.0900***
	(0.002)	(0.002)
Savings proxy	0.0000***	0.0000***
	(0.000)	(0.000)
Real Total income	0.0000***	0.0000***
	(0.000)	(0.000)
High school	0.0788***	0.0797***
	(0.004)	(0.004)
College	0.0780***	0.0811***
	(0.006)	(0.006)
Graduate School	0.1199***	0.1231***
	(0.008)	(0.008)
Black	-0.1511***	-0.1517***
	(0.004)	(0.004)
Hispanic	-0.0356***	-0.0359***
	(0.009)	(0.009)
Asian	0.0104	0.0098
	(0.008)	(0.008)
Native American	-0.0705***	-0.0697***
	(0.013)	(0.013)
Mixed	-0.0907***	-0.0914***
	(0.009)	(0.009)
Employed	0.0672***	0.0671***
	(0.006)	(0.006)
Not in the Labor force	0.1149***	0.1145***
	(0.006)	(0.006)
NILB (cannot work)	-0.0214**	-0.0225***
	(0.009)	(0.009)
Naturalized	0.0298***	0.0313***
	(0.008)	(0.008)
Non Citizen	-0.1728***	-0.1711***
	(0.006)	(0.006)
N	219701	219701

Note: We also include Year fixed effects, Metro Fixed effects and state fixed effects. Marginal effects are reported.
Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3: Does Heterogeneity exist Across Education Level in the Importance of Marriage Market Signals for Homeownership for the Never Married?

Variables:	Less than High School	High School Completed	College Completed	Graduate School
	(1)	(2)	(3)	(4)
Panel B: Using Female Marriage Market Signals				
Lagged Female	-0.0100***	-0.0065***	-0.0139***	-0.0168***
Marriage Rate	(0.001)	(0.000)	(0.002)	(0.003)
Lagged Female	0.0001***	0.0001***	0.0001***	0.0001***
Marriage Rate Sq.	(0.000)	(0.000)	(0.000)	(0.000)
Panel B: Using Male Marriage Market Signals				
Lagged Male	-0.0102***	-0.0071***	-0.0126***	-0.0112***
Marriage Rate	(0.001)	(0.000)	(0.001)	(0.002)
Lagged Male	0.0001***	0.0001***	0.0001***	0.0001***
Marriage Rate Sq.	(0.000)	(0.000)	(0.000)	(0.000)
N	38077	135975	32792	12597

Note: We also include controls for employment, interest income, real income, age, age square, ethnicity, Year fixed effects, Metro Fixed effects and state fixed effects, female share of female realtors, number of children. Marginal effects are reported.
Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4: Does Heterogeneity exist Across Race in the Importance of Marriage Market Signals to Homeownership for the Never Married?

Variables:	White Female	Black Female	Hispanic Female	Asian Female
	(1)	(2)	(3)	(4)
Panel A: Using Female Marriage Market Signals				
Lagged Female	-0.0103***	-0.0064***	-0.0043***	-0.0074***
Marriage Rate	(0.000)	(0.000)	(0.000)	(0.001)
Lagged Female	0.0001***	0.0001***	0.0000***	0.0001***
Marriage Rate Sq.	(0.000)	(0.000)	(0.000)	(0.000)
Panel B: Using Male Marriage Market Signals				
Lagged Male	-0.0111***	-0.0067***	-0.0045***	-0.0085***
Marriage Rate	(0.000)	(0.000)	(0.000)	(0.001)
Lagged Male	0.0001***	0.0001***	0.0001***	0.0001***
Marriage Rate Sq.	(0.000)	(0.000)	(0.000)	(0.000)

Note: We also include controls for employment, interest income, real income, age, age square, education level, Year fixed effects, Metro Fixed effects and state fixed effects, female share of female realtors, number of children. Marginal effects are reprted.
Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5: Does Age matter in the Role of Marriage Market Signals on Homeownership?

Variables:	Less than High School (1)	High School Completed (2)	College Completed (3)	Graduate School (4)
Never Married Below 35				
Panel A1: Using Female Marriage Market Signals				
Lagged Female	-0.0089***	-0.0057***	-0.0100***	-0.0136***
Marriage Rate	(0.001)	(0.000)	(0.002)	(0.003)
Lagged Female	0.0001***	0.0001***	0.0000***	0.0001***
Marriage Rate Sq.	(0.000)	(0.000)	(0.000)	(0.000)
N	27649	101735	22221	5551
Panel A2: Using Male Marriage Market Signals				
Lagged Male	-0.0086***	-0.0054***	-0.0075***	-0.0111***
Marriage Rate	(0.001)	(0.000)	(0.002)	(0.003)
Lagged Male	0.0001***	0.0001***	0.0001***	0.0001***
Marriage Rate Sq.	(0.000)	(0.000)	(0.000)	(0.000)
N	27649	101735	22221	5551
Above 35				
Panel B1: Using Female Marriage Market Signals				
Lagged Female	-0.0122	-0.0129**	-0.0365***	-0.0325***
Marriage Rate	(0.012)	(0.007)	(0.013)	(0.012)
Lagged Female	0.0001	0.0001*	0.0003***	0.0002**
Marriage Rate Sq.	(0.000)	(0.000)	(0.000)	(0.000)
N	10477	34425	10588	7055
Panel B2: Using Male Marriage Market Signals				
Lagged Male	-0.0172	0.0021	-0.0031	0.0174
Marriage Rate	(0.016)	(0.010)	(0.016)	(0.013)
Lagged Male	0.0001	-0.0000	0.0001	-0.0001
Marriage Rate Sq.	(0.000)	(0.000)	(0.000)	(0.000)
N	10477	34425	10588	7055

Note: We also include controls for employment, interest income, real income, age, age square, education level, Year fixed effects, Metro Fixed effects and state fixed effects, number of children. Marginal effects are reported.
Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6: Does Age matter in the Importance of Marriage Market Signals to Homeownership?

Variables:	White Female (1)	Black Female (2)	Hispanic Female (3)	Asian Female (4)
		Never Married Below 35		
		Panel A1: Using Female Marriage Market Signals		
Lagged Female	-0.0083***	-0.0047***	-0.0036***	-0.0054***
Marriage Rate	(0.000)	(0.000)	(0.001)	(0.001)
Lagged Female	0.0001***	0.0001***	0.0000***	0.0001***
Marriage Rate Sq.	(0.000)	(0.000)	(0.000)	(0.000)
N	85957	28474	26569	9272
		Panel A2: Using Male Marriage Market Signals		
Lagged Male	-0.0080***	-0.0045***	-0.0034***	-0.0059***
Marriage Rate	(0.000)	(0.000)	(0.001)	(0.001)
Lagged Male	0.0001***	0.0001***	0.0001***	0.0001***
Marriage Rate Sq.	(0.000)	(0.000)	(0.000)	(0.000)
N	85957	28474	26569	9272
		Never Married 35 and above		
		Panel B1: Using Female Marriage Market Signals		
Lagged Female	-0.0299***	-0.0035	0.0338*	-0.0095
Marriage Rate	(0.008)	(0.008)	(0.017)	(0.032)
Lagged Female	0.0002***	0.0000	-0.0003**	0.0001
Marriage Rate Sq.	(0.000)	(0.000)	(0.000)	(0.000)
N	292110	19267	8672	2973
		Panel B2: Using Male Marriage Market Signals		
Lagged Male	0.0207	-0.0094	-0.0573*	-0.0769*
Marriage Rate	(0.013)	(0.008)	(0.031)	(0.039)
Lagged Male	-0.0001	0.0001	0.0004*	0.0006**
Marriage Rate Sq.	(0.000)	(0.000)	(0.000)	(0.000)
N	29211	19267	8672	2973

Note: We also include controls for employment, interest income, real income, age, age square, education level, Year fixed effects, Metro Fixed effects and state fixed effects, number of children. Marginal effects are reported.
Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 7: Does Having A Child Matter in the Importance of Marriage Market Signals to Homeownership?

	(1)	(2)
	Never Married with at least one child	Never Married with no children
	Panel A1: Using Female Marriage Market Signals	
Lagged Female	-0.0040***	-0.0084***
Marriage Rate	(0.000)	(0.000)
Lagged Female	0.0000***	0.0001***
Marriage Rate Sq.	(0.000)	(0.000)
N	85957	28474
	Panel A2: Using Male Marriage Market Signals	
Lagged Male	-0.0043***	-0.0092***
Marriage Rate	(0.000)	(0.000)
Lagged Male	0.000***	0.0001***
Marriage Rate Sq.	(0.000)	(0.000)
N	85957	28474

Note: We also include controls for employment, interest income, real income, age, age square, education level, Year fixed effects, Metro Fixed effects and state fixed effects, number of children. Marginal efefcts are reported.
Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$