Collateralized Marriage *

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We develop a model of the household where investments in household public goods can be made at the cost of future earnings. If couples cannot commit ex ante to a sufficiently equal post-divorce allocation, households will not be able to capture the full potential value of marriage in terms of household specialization and public goods' creation. However, investing in joint assets, which the marriage contract specifies are to be divided in the case of divorce, can reduce this problem by offering insurance to the lower earning partner. For those able to access this "collateralized" version of the contract, there will be more household specialization, more public goods, and a higher value of marriage. We test the model's predictions by proxying access to the collateralized contract with lower local housing prices at the time of marriage, and find support for our hypotheses. We also estimate that policies that eroded marriage's commitment value over time led to greater stratification in marriage rates by wealth, which has significant policy implications.

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1 Introduction

Marriage is declining as the central organizing structure of the American family. As more individuals choose non-marital fertility, one might wonder whether marriage is too strong a contract, leaving people wanting a weaker alternative. In this paper, we offer theoretical and empirical evidence for an alternate view: that marriage's value is higher the stronger the contract offered, and that the weakening of the marriage contract has in fact created a disadvantage for those who do not have alternatives to create a strong contract. Our model and empirical evidence suggest that when a couple can collateralize their union through joint savings, they can have a higher degree of household specialization, which raises the production value of marriage. We then show that this implies that as marriage and non-marital fertility have become more similar, wealth, which allows for collateralization, has become a stronger predictor of choosing marriage.

We follow recent literature in hypothesizing that one role of marriage is to offer a way for couples to share the costs of investments in public goods, such as children (Lundberg and Pollak, 2015). Importantly, such investments often generate costs that are born in the future, in the form of lower earning potential for one partner. Time spent at home with children, which might affect future wages, is one example, but other examples abound: location choice that benefits one person's career but hurts the other's, caring for a sick partner at the cost of time spent investing at work, performing any form of housework. Each of these creates shared returns, while potentially creating private costs in the future, depending on the strength of commitment when the investment is made. Marriage, by providing a contract, should provide the investing party with some assurances that both the gains and future costs will be shared, even if the relationship dissolves. However, as various policy changes have weakened the relative commitment value of the marriage contract, individuals may have too little insurance to make these large investments, and therefore the overall value of marriage will be limited.

To examine this, we look at individuals who have access to a differentially stronger marriage contract: those who are able to accumulate joint assets over the course of the marriage. We refer to these marriages as "collateralized." Importantly, the marriage contract uniquely specifies the division of joint assets upon divorce, and this division has not been weakened by subsequent policy changes.

We specify a model with household public goods requiring time investments, which come at the expense of income growth of the investing party.[1] As couples' costs of investment are not equal, they will optimally choose some specialization as long as they have full inter-temporal commitment to future income sharing. With limited commitment, where couples cannot commit to a post-divorce income split beyond that mandated by courts, specialization will be sub-optimally low, resulting in lower public goods' production and less marital stability. If the couple is able to collateralize the marriage through joint savings, however, the couple will choose to pass some of their endowment into the second period to act as insurance for the lower earning partner. This will lead to a higher degree of specialization, more public goods, and more marital stability.

Finally, we allow couples to select whether to marry or to cohabit. Assets provide the ability to collateralize the marriage, and thus more assets increase the attractiveness of marriage when there is imperfect

[1] In this way, we depart somewhat from literature that has seen women's labor supply as reflecting bargaining power to spend time on leisure (e.g., Voena, 2015 and Chiappori and Oreffice, 2008) by emphasizing the productive value of time away from work for producing household public goods.

commitment. As marriage and cohabitation become contractually more and more similar, a greater correlation between assets and marriage will arise.

We then turn to empirically evaluating whether there is support for the model's predictions. We show there is a clear link between assets and specialization in marriage. But as this could be driven by other factors correlated with owning assets, we seek exogenous variation in access to joint savings. Housing is one asset that courts are particularly likely to divide equally at the moment of divorce, and we find that idiosyncratic variation in housing prices at the time of marriage creates variation in homeownership that can be used for identification.

We find that lower housing prices at the time of marriage leads to greater household specialization, with men working more and women working less. Wages follow the same pattern, with men's wages responding positively to easier homeownership while women's earnings decline. We also find suggestive evidence of higher public good provision (as proxied by number of children and a proxy of human capital acquisition for these children) and lower divorce rates with easier home access. We find the results extremely robust to a variety of additional checks: they do not appear to be driven by migration or the recent housing crisis, and are robust to focusing on finer MSA-level price variation. To eliminate concerns that correlated economic factors may be driving our results, we utilize the strategy of Palmer (2015) to instrument for housing prices, and find this strengthens our results.

Our model also suggests that wealth will be an important predictor of marriage in the presence of imperfect commitment, something we presented evidence for in Lafortune and Low (2017). But the model allows us to go further and predict that this connection between wealth and marriage should strengthen as the marriage contract becomes more similar to the alternative available for couples who choose non-marital fertility. We exploit two such policies that have state-year variation in the timing of their introduction to test this hypothesis. First, the introduction of unilateral divorce, which made marriage, similarly to cohabitation, a contract that either party could choose to dissolve, and secondly the strengthening of child support enforcement for non-marital fertility relationships. Using data from the Panel Study of Income Dynamics (for unilateral divorce) and the Survey of Income and Program Participation (for child support enforcement), we show that an individual's wealth became a much stronger predictor of marriage rates as the relative strength of the marriage contract was weakened. This suggests an increasing role for wealth in who can access the benefits of marriage for supporting optimal specialization and child investment.

Our work relates to several literatures. The fact that higher public good provision appears to occur in marriage compared to cohabitation has been discussed previously. Children of married parents receive more investment than those of unmarried parents (Ginther and Pollak, 2004; McLanahan and Sandefur, 1994). Our model suggests that in addition to likely selection effects, marriage itself may causally induce higher public good provision through greater contract strength. This relates to literature showing that time and money investments cannot be substituted in producing child human capital (Del Boca et al., 2013) and that returns to intensive parenting may be increasing over time (Doepke and Zilibotti, 2017; Ramey and Ramey, 2010). Importantly, our work suggests the contractual basis needed to insure intensive parenting investments may not be equally available to all.

Accordingly, our work also relates to literature identifying a gradient in the United States by socioeconomic status in rates of marriage versus cohabitation (Lundberg et al., 2016). Our research suggests that

wealth inequality, rather than tastes, could be a potentially important driver. This is also consistent with findings in sociology literature of a relationship between wealth and marriage (Schneider, 2011). Our research suggests a channel through which this inequality could persist across generations, since those with more wealth are able to elicit higher investments in children, which will then lead to higher human capital in the next generation.

By introducing the interaction between assets and the marital contract—collateralization—we contribute to literature on the impact of marital and non-marital contracting for behavior. While many authors have explored the reasons for declining marriage rates, and accompanying increases in non-marital fertility (Akerlof et al., 1996; Mechoulan, 2011; Duncan and Hoffman, 1990; Rosenzweig, 1999; Nechyba, 2001; Neal, 2004), ours is the first to explore the role of assets in substituting for other legal protections. We also relate to literature looking at the strengthening of non-marital contracting, including child support enforcement in the US (Aizer and McLanahan, 2005; Tannenbaum, 2015; Rossin-Slater, 2016), and other protections for cohabitants in other countries (Chiappori et al., 2017b; Chigavazira et al., 2019). Many papers have also examined the impact of increased ease of divorce,[2] including the switch to unilateral consent (Friedberg, 1998; Ananat and Michaels, 2008; Holden and Smock, 1991; Gruber, 2004; Cáceres-Delpiano and Giolito, 2008; Wolfers, 2006).[3] This legal change has been shown to erode the commitment value of marriage, which women optimally respond to by increasing their human capital accumulation (Bronson, 2014) and labor supply (Stevenson, 2008; Fernandez and Wong, 2011) while decreasing their "marriage-specific capital" (Stevenson, 2007).[4] Our work thus also relates to literature on rising female labor force participation and the decline in specialization more broadly (Goldin, 2006; Fernández, 2013; Greenwood et al., 2005). Reynoso (2017) suggests that due to decreased specialization, higher divorce will also be linked to an increase in assortative mating. Fernandez and Wong (2017) demonstrates that unilateral consent regimes are likely to decrease women's welfare, due to men's higher earnings. Voena (2015) shows that unilateral divorce has differential impact on existing marriages depending on the property division regime, suggesting that women have increased bargaining power when they are guaranteed higher divorce settlements. We introduce the idea that assets may be used *ex ante* by couples to induce greater investments in household public goods, thus raising the value of marriage to both parties.

Finally, our paper relates to other work on assets as commitment devices. Previous literature has shown the importance of collateral in borrowing contracts, helping to overcome both moral hazard and adverse selection, and thus potentially reducing credit rationing (see Steijvers and Voordeckers (2009) for a summary of literature). However, there has been less focus on the role of collateral in increasing commitment in bilateral contracts, perhaps because in few contracts is there formal legal enforcement of collateral division in case the joint venture dissolves. Our work suggests that contracts that allow for collateral to be placed in a pool for division in case the contract dissolves, as the marriage contract does, could potentially allow for an increase in economic efficiency. Broadly, our model suggests that when individuals are unable to commit perfectly, dynamic inefficiencies arise, as has been discussed by Mazzocco (2007) and Chiappori and Mazzocco (2017). What is novel is that we suggest the use of joint assets may diminish these inefficiencies. Previously, the role of financial resources in relationship dissolution has been discussed by Brinig (1990), who examines diamond

[2]Mechoulan (2005) summarizes the theoretical approaches to divorce in the literature.

[3]Brown et al. (2015) by contrast examines different levels of mandatory child support upon divorce.

[4]Interestingly, Stevenson (2007) additionally shows no decrease in homeownership on average, which is consistent with our model because homeownership is not so much "marriage-specific capital," but rather partially a commitment device that will be sought by those who contract marriage, even with easier divorce.

engagement rings, and Ambrus et al. (2010), who look at bride prices in Bangladesh, and Bayot and Voena (2015) who look at property division and prenuptial contracts in Italy. .

There is more limited literature on the topic of homeownership and marriage. Farnham et al. (2011) show that higher house prices makes marriages less stable, while Lagomarsino et al. (2017) show that a lottery that provides homes counterintuitively increases reported domestic violence. Wei and Zhang (2011) and Wei et al. (2012) document the role of homeownership as a precursor to marriage in China. We contribute to this literature by discussing for the first time how homeownership may serve to "collateralize" the marriage contract, thus increasing the wedge between the attractiveness of marriage and cohabitation for those able to purchase homes.[5]

The rest of this paper is organized as followed. We present the model and its predictions in Section 2. We then demonstrate that access to a more collateralized version of the marriage contract alters the behavior of married couples in accordance to our framework in Section 3. We then show that the role of collateral has increased as marriage and cohabitation have become more similar in Section 4 while Section 5 concludes.

2 Model

We present a standard model of marriage with a public good in which both parents can invest, at a cost to their future earning potential. We initially set up a cooperative model, where decisions are made efficiently with full commitment, but then introduce the fact that individuals cannot commit to the resource allocation in case divorce occurs, which leads to inefficient reduction in household specialization and investment in public goods. We then introduce the possibility of a savings vehicle whose returns are divided more equally than income upon divorce. Access to this product reduces the inefficient investment problem since it offers insurance to the partner who makes the greater investment as well as reduces the other partner's incentives for divorce. This increases household specialization, raises public goods' creation, and in turn raises the value of marriage.

2.1 Setup

A couple live for two periods, and care about private consumption (c), over which they have concave utility, and a public good (Q). Utility for partner k in period t is thus of the form $U_{kt} = u(c_{kt}) + Q$.

Let Ω_i represent the earnings (adjusted for household productivity) of the lower earning partner and Ω_j represent the earnings of the higher earning partner. For convenience, we will call the higher-earning partner, j, the male partner or husband, and the lower-earning partner the female partner or wife. However, there is nothing in our model that is inherently gendered.[6]

[5]This may help explain the central importance of home purchases to American families, particularly married couples as shown by Goodman and Mayer (2018). Housing is a large portion of American wealth: principal residences make up 66% of the wealth held by middle-income Americans (Wolff, 2012). This apparent "over-investment" in one type of asset has been documented previously by Fratantoni (1998) and various theories have been provided to explain this pattern (e.g., Henderson and Ioannides (1983) and Flavin and Yamashita (2002)). Why would Americans choose to invest so heavily in an illiquid asset that suffers large price shocks? Our model implies that the illiquidity may actually be an appealing feature of homeownership in terms of its ability to secure the marriage contract. Although in the case of divorce the investment in an "at risk" asset may seem suboptimal, ex ante it provides value by reducing the cost of investments that benefit both spouses.

[6]Our empirical estimations will follow the statistics that women tend to be the lower earning partners on average. In addition

In the first period, couples select the level of time investment for each partner to make in the public good, τ_i and τ_j. One example of a household public good would be children, but there can be other household public goods as well. These investments come at the cost of future earnings. We assume parents are restricted to spend a unit of time investing in either work or the public good. Thus, partner k's second period earnings will be $\Omega_k(1-\tau_k)$. As a result, the higher is the level of investment, the higher the utility partners derive from the public good, but also the lower the consumption possibilities in the second period.

The function $Q(\tau_i, \tau_j)$ is concave in both arguments, and for simplicity has the property that $\frac{\partial Q}{\partial \tau_i} = \frac{\partial Q}{\partial \tau_j}$ and $\frac{\partial Q}{\partial \tau_k} \to \infty$ as $\tau_k \to 0$. These restrictions mean that neither partner has an absolute advantage in investing, and both partners would find it optimal to invest at least a small amount.[7] Note that it would be easy to replace the unequal endowments with an unequal return to investing in public goods. Thus, one should think of the partner with the lower Ω as the partner with the comparative advantage in household investments, and the partner with the higher endowment as the partner with the comparative advantage in market work.

Utility in the first period is certain, while utility of each partner in the second period is subject to a common utility shock, ϕ, centered around zero, whose cumulative distribution will be denoted $L(\phi)$. Bad shocks may cause individuals to prefer dissolving the relationship, in which case they avoid the shock. Assuming divorce does not destroy any value other than through its impact on consumption, Pareto separation occurs whenever $\phi < 0$.

Individuals could receive different consumption when divorced than when married, so second-period consumption utility will be given by $E(u(c_{2k})) = (1-p)u(c^m_{2k}) + pu(c^d_{2k})$, where $p = P(\phi \leq 0)$ and c^m_{2k} denotes the consumption of individual k when married and c^d_{2k} denotes the consumption when divorced.

2.2 Full commitment cooperative decision-making

We assume that a couple maximizes the sum of their utilities, or joint household production.[8] To first establish the full commitment benchmark, we assume individuals can fully commit to how to share resources when divorced.

Then, the couple's problem can be summarized as:

$$\max_{\tau_i, \tau_j} \quad u(c_{1i}) + u(c_{1j}) + E(u(c_{2i})) + E(u(c_{2j})) + 2E(\phi|\phi > 0) + 4Q(\tau_i, \tau_j) \tag{1}$$

subject to the following constraints

$$c_{1i} + c_{1j} = \Omega_i + \Omega_j$$

$$c^m_{2i} + c^m_{2j} = c^d_{2i} + c^d_{2j} = \Omega_i(1-\tau_i) + \Omega_j(1-\tau_j).$$

to other forces, this could represent the fact that one of the main public good we will think of are children and that pregnancy, birth, and breastfeeding all must necessarily be done by the mother, and therefore mothers typically have a higher household productivity in these aspects. In line with this, the literature shows that mothers pay a higher price in wages for having a child than their partners (e.g Adda et al., 2017; Kleven et al., 2017; Bronson et al., 2017; Angelov et al., 2016).

[7] Relaxing that assumption would simply make our results more stark.

[8] This is isomorphic to a collective model with symmetric weights, and our conclusions would also hold for unequal weights, as long as consumption is shared more equally in marriage than is mandated in divorce.

The public good function Q is here multiplied by 4 since both parents enjoy the public good in both periods.[9] Investments in the public good will be made until

$$\frac{\partial \left[E(u_{2i}) + E(u_{2j})\right]}{\partial \tau_k} = 4\frac{\partial Q}{\partial \tau_k}. \tag{2}$$

Note this condition simply requires that the marginal benefit of investing in public goods in terms of utility derived from them be equated to the expected marginal cost which is born in the second period.

Since they behave cooperatively, the optimum will be equal sharing of resources in all periods and states of the world such that consumption of both partners in the first period will be given by $c_1 \equiv \frac{1}{2} * (\Omega_i + \Omega_j)$ and consumption of both partners in either marriage or separation in the second period will be given by $c_2 \equiv \frac{1}{2} * (\Omega_i(1-\tau) + \Omega_j(1-\tau_j)$.

Using the fact that we will have equal sharing and perfect insurance, we can collapse the left-hand side of equation 2as follows:

$$\begin{aligned}
\frac{\partial \left[E(u_{2i}) + E(u_{2j})\right]}{\partial \tau_k} =& (1-p)\left(\frac{\partial u(c^m_{2k})}{\partial \tau_k} + \frac{\partial u(c^m_{2k'})}{\partial \tau_k}\right) + p\left(\frac{\partial u(c^d_{2k})}{\partial \tau_k} + \frac{\partial u(c^d_{2k'})}{\partial \tau_k}\right) \\
=& (1-p)(\frac{1}{2}\Omega_k u'(c_2) + \frac{1}{2}\Omega_k u'(c_2)) + p(\frac{1}{2}\Omega_k u'(c_2) + \frac{1}{2}\Omega_k u'(c_2)) \\
=& \Omega_k u'(c_2).
\end{aligned}$$

Yielding the following condition for optimal investment of either partner:

$$\Omega_k u'(c_2) = 2\frac{\partial Q}{\partial \tau_k}.$$

As such, the optimal household specialization will be proportional to the difference in endowments between partners.

$$\frac{\Omega_i}{\Omega_j} = \frac{\frac{\partial Q}{\partial \tau_i}}{\frac{\partial Q}{\partial \tau_j}}$$

2.2.1 Imperfect commitment

Let us now assume that partners cannot commit to a post-divorce division of resources. In divorce, although there may be some income sharing mandated by the court, we assume it will not make up for the full income sharing within marriage (Del Boca and Flinn, 1995). Thus, we will have that $c^d_{2i} = (1-\beta)\Omega_j(1-\tau_j) + \beta\Omega_i(1-\tau_i)$ and $c^d_{2j} = \beta\Omega_j(1-\tau_j) + (1-\beta)\Omega_i(1-\tau_i)$ with $\beta > \frac{1}{2}$.

This will imply that some men will wish to divorce when their partner will not want to do so since the distribution of endowments of men stochastically dominates that of women. Specifically, they will want to divorce when $u(c_2) + \phi < u(c^d_{2j})$ which will occur when $\phi < \bar{\phi} = u(c^d_{2j}) - u(c_2) > 0$. Divorce will not occur at that value since women will want to remain in the relationship but they will need to offer to their partner the consumption they would obtain in divorce for them to remain in the relationship.

[9] The exact assumption as to when the public good is enjoyed is absolutely irrelevant to our results.

The couples' problem remains as in (1), but consumption whenever $\phi < \bar{\phi}$ will deviate from the married values. Specifically, when divorced, $\phi < 0$ it will be as above, and when consumption is renegotiated, but divorce avoided, consumption will be c'_{2i} and c'_{2j}, where $u(c'_{2j}(\phi)) = u(c^d_{2j}) - \phi$. The expectation in the second period of 1 is now a weighted average of three scenarios:

$$E(u(c_{2i})) + E(u(c_{2j})) = \underbrace{(1-\bar{p})(u(c^m_{2i}) + u(c^m_{2j}))}_{\text{marriage}} + \underbrace{\int_0^{\bar{\phi}} (u(c'_{2i}) + u(c'_{2j}))d\phi}_{\text{renegotiation}} + \underbrace{p(u(c^d_{2i}) + u(c^d_{2j}))}_{\text{divorce}} \quad (3)$$

where $\bar{p} = P(\phi < \bar{\phi})$.

Let's define the income sharing that occurs for any level of ϕ where renegotiation occurs as γ_ϕ weight placed on own income, where $\frac{1}{2} < \gamma_\phi < \beta$ for $k = i, j$ and $0 < \phi < \bar{\phi}$.

It is easy to show that equal sharing will continue to occur in the first period and in the second period whenever $\phi \geq \bar{\phi}$. However, the lower level of consumption sharing in either the renegotiated or divorced state will affect first period child investment decisions.

Proposition 1 *Households will specialize less with imperfect commitment. Public goods' creation will be lower. The less income sharing there is upon divorce, the less specialization and lower public goods' creation there will be.*

Proof. Recall the couple will choose τ_i and τ_j such that:

$$\frac{\partial \left[E(u_{2i}) + E(u_{2j})\right]}{\partial \tau_k} = 4\frac{\partial Q}{\partial \tau_k}.$$

The left-hand side of the expression will become:

$$\Omega_k \left((1-\bar{p})u'(c_2) + p(\beta u'(c^d_{2k}) + (1-\beta)u'(c^d_{2k'})) + \int_0^{\bar{\phi}} (\gamma_\phi u'(c'_{2k}) + (1-\gamma_\phi)u'(c'_{2k'}))d\phi \right)$$

Note that while investment could alter the renegotiation threshold $\bar{\phi}$, that derivative is not included in the expression since the utility of partners is the same in the married and the renegotiated outcome when ϕ is exactly equal to $\bar{\phi}$.

The ratio of investments for men versus women will be equal to the ratio of this expression, the marginal costs, for men's and women's investments. The ratio of Ωs remains the same, so the question is how the section inside the parentheses compares between the two.

We can think of this expression as a weighted average of the cost when married, the cost when consumption is renegotiated, and the cost when divorced. The portion of the weight on the married scenario is the same for men and women, as it was in the case of perfect commitment.

However, in the divorced case, women will have lower consumption, and thus when choosing women's investment, the cost will be higher than when choosing men's, because although investment will affect both individual's consumption, it will affect her consumption more, since $\beta > \frac{1}{2}$, and her marginal utility of consumption will be higher since her total consumption will be lower. For men's investment, the exact

opposite is true, since more weight will be placed on the impact on his consumption, which has a lower marginal utility due to its higher level. Thus, the divorced state will encourage less specialization. Since the consumption sharing at any level of ϕ between $\bar{\phi}$ and 0 is between $\frac{1}{2}$ and β, the same will be true in the renegotiated scenario, to a lesser extent.

Thus, we will observe that the ratio of marginal costs of the spouses will be much higher than Ω_i/Ω_j, leading to less household specialization than in perfect commitment.

This will lead to lower Q since the household has added constraints compared to the case of perfect commitment. The only way that public goods' creation could rise is if households previously sacrificed public goods to achieve more consumption sharing. But this is impossible since perfect household sharing decreases the marginal cost of investing in public goods for the household. Thus, imperfect commitment will also decrease household public goods.

Both of these results worsen as β grows, thus implying that as unequal income sharing increases, the larger will the impact of imperfect commitment be. ■

Intuitively, since the woman bears a larger share of the cost of the investment when divorced and she is the poorer member of the household, thus making the fall in income more costly to her, the couple will decrease their household specialization when they know that equal sharing will not occur in divorce, which leads to lower public goods' creation.[10]

2.3 Savings and commitment technology

We now allow couples to transfer resources from the first to the second period through savings. Denote their initial asset level as A, their amount of savings as s and the return that they can obtain as r.

Importantly, the marriage contract stipulates that all assets accumulated during the marriage are *joint* property, because marriage as a legal contract rests on the presumption of division of labor, and thus shared production. Joint assets are to be divided either evenly (in community property states) or "equitably" (Kay, 2000) upon divorce. As one illustration, if a husband is the sole earner, and therefore pays every single mortgage payment on the family home, these payments nonetheless make up a joint asset that will be divided at the time of divorce.[11]

The maximization problem remains the same but the constraints are altered such that:

$$c_{1i} + c_{1j} = \Omega_i + \Omega_j + A - s$$

$$c_{2i}^m + c_{2j}^m = c_{2i}^d + c_{2j}^d = \Omega_i(1-\tau_i) + \Omega_j(1-\tau_i) + s(1+r)$$

Under perfect commitment, we will maintain the same sharing rule as before, and thus investments will

[10] A man could sacrifice in marriage more than the efficient level of income so as to incentivize a higher level of investment from his wife. The problem with this is that it would increase his desire for divorce in the second period, thus decreasing incentives for investment, and that it would make the allocation of resources further from Pareto optimum when married.

[11] This does not imply that it is impossible for cohabiting couples to replicate at least partially this through a legal contract. However, it will be more difficult, more costly and less secure than marriage. Nevertheless, the key element is that it will be reserved for wealthy individuals who will be able to put something "at risk". Thus, again, those with higher assets will have more household specialization and higher public good provision.

be determined by the same equation as before and a couple will invest until

$$u'(c_1) = u'(c_2)(1+r)$$

With imperfect commitment, the divorced division of consumption will now be given by $c_{2i}^d = (1-\beta)\Omega_j(1-\tau_j) + \beta\Omega_i(1-\tau_i) + 0.5(1+r)s$ and $c_{2j}^d = \beta\Omega_j(1-\tau_j) + (1-\beta)\Omega_i(1-\tau_i) + 0.5(1+r)s$. We see that now, women will receive a more equal sharing of resources if s is large. This gives rise to the following proposition:

Proposition 2 *Assuming imperfect commitment but the capacity to save, if a couple has access to a savings vehicle through which assets are divided under a more equal distribution than income, they will have more specialization within the household than couples without access to that vehicle. They will also save more, have higher household public goods, and have more relationship stability.*

Proof. If a couple will divide assets equally upon divorce, then for a given amount of savings $\bar{\phi}$ will be lower than if they cannot since the man receives less resources upon divorcing, thus decreasing his desire to do so. This will make the marginal cost of women and men's investment more similar than when savings are shared unequally. Secondly, it reduces the difference between c_{2i}^d and c_{2j}^d. This will make the marginal cost of women and men more similar than before since the consumption of both will be more similar which will imply that will pay β and $1-\beta$ in cases where their marginal utility of consumption will be less different. Thus, household specialization will increase with access to the savings vehicle. By the same argument as before, this will imply higher Q and relationship stability for a given level of savings.

Access to the savings vehicle will also lead to more savings. Under imperfect commitment, the decision to save is given by

$$u'(c_1) = \frac{\partial E(u(c_{2i} + u(c_{2j})))}{\partial s}$$

Note again here the omission of the impact of savings on $\bar{\phi}$ since this does not affect marginally the sum of partners' utility.

If a couple will divide assets equally upon divorce, left-hand side of the above equation is given by

$$\frac{\partial E(u(c_{2i} + u(c_{2j})))}{\partial s} = (1+r)\left((1-\bar{p})u'(c_2) + p(\frac{1}{2} * u'(c_{2i}^d) + \frac{1}{2} * u'(c_{2j}^d))\right) + \int_0^{\bar{\phi}} (u'(c'_{2i})\frac{\partial c'_{2i}}{\partial s} + u'(c'_{2j})\frac{\partial c'_{2j}}{\partial s})d\phi$$

while if savings are shared in the same way as income is, it is given by

$$\frac{\partial E(u(c_{2i} + u(c_{2j})))}{\partial s} = (1+r)\left((1-\bar{p}')u'(c_2) + p((1-\beta) * u'(c_{2i}^d) + \beta * u'(c_{2j}^d))\right) + \int_0^{\bar{\phi}'} (u'(c''_{2i})\frac{\partial c''_{2i}}{\partial s} + u'(c''_{2j})\frac{\partial c''_{2j}}{\partial s})d\phi$$

where, as we have argued before $\bar{p} < \bar{p}'$ and where c''_{2k} represents the renegotiated consumption when savings are not shared equally upon divorce.

We can show that the incentives for savings are higher when savings are divided equally upon divorce since in the opposite case, the returns are highest when the consumption levels are also higher, thus reducing

the incentives for savings. Basically, insurance motives are absent when savings are shared in the same way as income while they are at play when assets are divided equally. This is further amplified by the fact that $\bar{p} < \bar{p}'$.

In addition to that, if $u''' > 0$, by Jensen's inequality, it is easy to show that the first term will imply higher savings than in the full commitment case. This will raise second period income for women compared to the imperfect commitment which will in turn incentivize more investment, since a higher consumption level in period 2 reduces the marginal cost of lost income from child investment. ■

2.4 Selection into marriage

So far, we have focused on the behavior within marriage, rather than the decision to marry. While we do not wish to go as far as endogenizing the matching process, we will assume that our couple can decide, in the first period, to enter either cohabitation or marriage. In the United States, cohabitation traditionally offered no protection to partners at the moment of separation. One could think of cohabitation in this setting as being like a marriage with imperfect commitment where $\beta = 1$. Over time, the protection has grown, with some child support enforcement outside of marriage, decreasing β toward the married level.

Importantly, under US law, in cohabitation, assets are owned by whoever acquires them, no matter the duration of the relationship.[12] Replicating asset sharing outside of the marriage contract would be quite costly and legally complex. We will thus assume that savings are always shared in a way that favors the richer partner, since he is more likely to be able to acquire the savings.

If couples can choose which relationship to enter, the decision will be made based on the total utility partners can ex-ante anticipate to receive in each case. Assume that marriage has higher fixed costs, and therefore will only be preferred by couples who receive sufficiently large benefits from the stronger contract to justify the costs. Higher endowment couples will be more likely to choose marriage, as would, for example, couples who had a Q function that yielded higher utility from public goods, e.g., children. But note, one key insight of our model is that this relationship between marriage and public good provision like children may not only be selection, but may be a causal effect of marriage. In our model, couples who choose marriage will have more specialization and higher public goods than that same couple would have had counterfactually if they were restricted to a cohabitation relationship.

Proposition 3 *A increases the attractiveness of marriage in the presence of imperfect commitment.*

Proof. The ability to save in a vehicle that is divided equally allows couples to reduce the impact of imperfect commitment. As A increases the capacity of a couple to save, imperfect commitment will have less impact on couples that have larger values of A. As A goes to infinity, savings will be much larger than income, thus rendering the inability to continue sharing income post-divorce irrelevant. In addition, when savings are so large and divided equally upon divorce, divorce probability will tend to that of perfect commitment. Thus, as A increases, the behavior within marriage will resemble more and more that of perfect commitment, increasing the value of marriage. In addition, as A increases, the fact that cohabitation does not divide

[12]There is also very little "common law marriage" in the United States–only very few states even allow long-term cohabiting couples to petition the court to be treated as married ex-post, and they must present evidence, such as that a wedding ceremony took place.

assets equally upon separation will increase the probability that the man will want to separate and the difference in consumption in the second period for men and women will widen, reducing the attractiveness of cohabitation. Thus, A will increase the attractiveness of marriage versus cohabitation when there is imperfect commitment. ■

Thus, the couple prefers to "tie their savings to the mast" in order to enter a more binding contract, and thus reap more value from the marriage. This also provides an explanation for the relative rarity of prenuptial contracts in the US (Weiss and Willis, 1993), since the husband *wants* to guarantee division of joint assets such as the marital home.[13]

This role of savings in determining marriage selection will become more important when cohabitation offers some income sharing, but retains the feature that assets are never shared in non-marital relationships.

Proposition 4 *A is more associated with marriage when marriage becomes more similar to cohabitation than when it is more different.*

Proof. In a world where marriage implies perfect commitment and cohabitation has no income sharing upon separation, couples with higher A may prefer marriage to cohabitation more frequently than those with lower assets, but this is simply because they would have higher consumption and higher child investment, making marriage more worth the entry cost. Once marriage and cohabitation become more similar (with marriage having imperfect commitment or cohabitation having more and more post-separation income, but not asset, sharing), A will be more relevant in the selection of marriage than before. This is because, in addition to the wealth effect that was previously present, A now allows couples to engage in a higher degree of specialization and consume higher Q, raising the return they can obtain from marriage. As cohabitation promises more post-separation income sharing, the attractiveness of cohabitation will not vary with the level of A that a couple has. Marriage, on the other hand, becomes differentially more valuable for those with more A. Thus, A will become a stronger predictor of the marriage decision as marriage and cohabitation become more similar. ■

2.5 Extensions

The key ingredient for our result is that imperfect commitment generates a loss of joint utility for the couple which leads to inefficient investment decisions and that this can be in part reduced when putting savings at stake when those are shared differently by divorce courts. There are many ways we could generalize this result.

Linear Utility If we assume that a couple makes investment decisions jointly, like in the above model, for joint utility to fall with imperfect commitment, we rely on the concavity of the utility function. Since our model emphasizes uncertainty, including risk aversion in the model seemed logical. However, we could alter our model to one where consumption is valued linearly but investment decisions are taken individually.

[13] One may wonder why he does not provide such security through a prenuptial agreement that is punitive toward the husband in case of divorce, but purchasing a home is likely to be more culturally accepted and easier to implement, since it provides other benefits while married. Moreover, if one wished to have such security *without* marriage, it would require extensive, and likely costly, contracting, since the marriage contract specifies the division of resources that are to be created throughout the marriage.

In that case, we would find lower investments with limited commitment since each member of the couple would end up "paying" a larger fraction of their own investment when they divorce, increasing the marginal cost of the investment and thus leading both to reduce their investment. In addition, women would decrease their investment more than men because for women, an increase in the man's desire to divorce decreases her utility since she looses from the renegotiation. Understanding that a higher investment on her part increases her partner's desire to divorce, she will thus further reduce her investment, leading to less household specialization. Adding savings would reduce the probability that a the man would want to divorce and thus reduce the bias in the decision of the woman. Thus, we could replicate the results presented above in this alternative framework.

Utility cost of divorce Also, in the model above, the utility a couple obtains from household public goods is the same within and outside of a relationship. If we assume instead that the enjoyment that a couple derives from public goods is reduced when divorced or separated, we generate some interesting additional insights.

Formally, let us assume that the utility from public goods becomes ηQ, where $\eta < 1$ when a couple is separated. This will now shift the divorce threshold as the husband will be less keen on divorcing than before since he will lose public goods upon divorce. Thus, even with $\phi < 0$, couples will be willing to remain together. Furthermore, the threshold of ϕ that will determine divorce will depend on Q. This implies that the couple will have an additional incentive to invest in public goods since, in addition to the factors we highlighted previously, by increasing her investment, they will now reduce the probability of him wanting to re-negotiate the contract or divorce, thus lowering the marginal cost of the investment.

In this context, if a couple has access to a joint savings technology, it will increase the incentives to invest in household public goods, as we discussed above. Since couples with that access have higher household public goods, they will divorce less than those without because this will affect the threshold of ϕ at which couples will find it optimal to separate. We thus obtain the additional theoretical result:

Proposition 5 *If public goods' enjoyment is lower upon divorce, couples who have access to savings that are divided equally upon divorce will have more stable relationships and less divorce.*

Leisure Unlike Voena (2015) and Chiappori and Oreffice (2008), our model does not feature leisure, and thus we think of reduced labor supply as primarily indicating higher public goods investment, rather than increased "bargaining power." Our results would still go through if we allowed women to split their reduced labor supply between investment in public goods and leisure. This is because higher consumption in the divorced state will nonetheless decrease her marginal cost of investment in public goods, and thus lead to a higher level of investment. In our model, her greater bargaining power is seen through her higher consumption in the renegotiated state. The couple is willing to extend her this increased bargaining power because of the benefits of increased public goods investment. Thus, the couple would also be willing to absorb greater leisure taken as a result of increased security in the second period, since this security would also increase public good provision and efficient specialization.

Marriage timing Another potential simplification in our model is that individuals marry in the first period as we abstract from marriage timing. To explore this, let us imagine now that individuals live for 3 periods. Individuals can either marry in the first or the second period. They can only have one such event in their life. The key change that this will introduce in our model is that single individuals could save from the first to the second period. This would allow them to put at risk more of their income and through that better incentivize child investment. Thus, individuals who have higher endowments could delay marriage more since this allows them to save larger amounts in the joint savings vehicle, thereby strengthening the relationship more. Poorer individuals would see less benefits to delaying marriage since they would not be able to accumulate large amounts of savings anyway. In that world, wealthier individuals will choose marriage, but delay it, while lower asset individuals will engage in early non-marital fertility. This matches the fact that there has recently been a crossover in the US between age at first birth and age at first marriage, with people having children younger on average (due to non-marital fertility) despite marrying later (Arroyo et al., 2012).

3 The Role of Collateral within Marriage

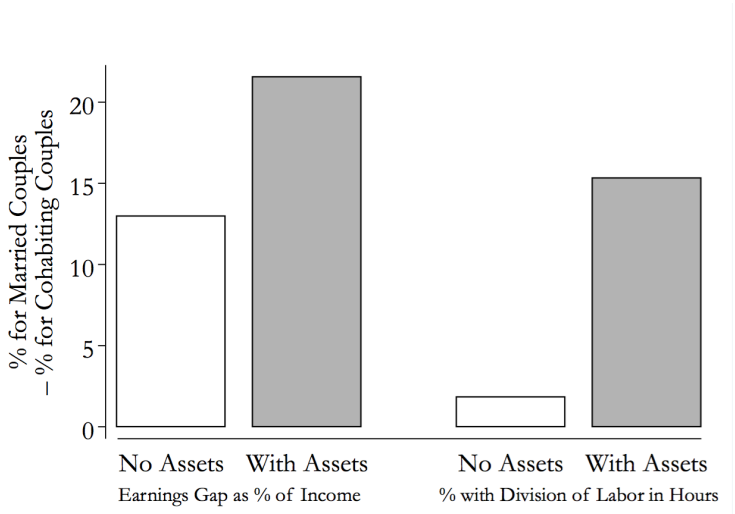
Having shown a model where collateralizing marriage increases labor specialization, household public goods, and relationship stability, we now turn to exploring that relationship empirically.

3.1 Stylized Facts

Our model suggests that assets would play an important role in marriage in terms of increasing specialization but they would not have that impact in cohabitation. We start by exploring whether there is any evidence of this in data. We use the 2015 Panel Study of Income Dynamics (PSID) to explore relative earnings and hours for couples who are cohabiting (an official designation in the PSID) versus married. We then compare the differences between married versus cohabiting couples for those with financial assets (indicated by interest income) and those without. Figure 1 displays the difference between married and cohabiting couples for two different measures of specialization, for couples with and without assets. We first look at the gap between the male partner and female partner's earnings, as a percentage of household income. A larger gap indicates more specialization. Married couples have a wider gap between male and female earnings versus cohabiting couples, but this difference is much larger for couples with assets. We then examine the ratio of hours worked between the male and female partner. A couple is defined as having a "traditional" division of labor if the male partner works more than ten hours, and either works more than twice the hours of the female partner or has a female partner who works zero hours. Among couples without assets, married and cohabiting couples show very similar fractions of couples having "traditional patterns." However, for couples with assets, we see substantially more specialization amongst those who marry versus those who cohabit. This is suggestive of marriage creating a more secure contract, enabling more specialization, when couples have the ability to jointly save, as predicted by our model.

However, this relationship may be driven by other differences between couples with and without assets. Our empirical application will focus more specifically on family housing as a means of accumulating joint assets for a married couple, since we can obtain exogenous variation in access to that savings vehicle. This

Figure 1: Gap Between Married and Cohabiting Couples in Specialization



Notes: Data uses the 2015 Panel Survey of Income Dynamics. Restricted to couples who are either cohabiting or married, where the male partner is between 21 and 44. Having assets is defined as having interest income, reflective of underlying assets. The lefthand side of the graph looks at the earnings gap between the male and female partner as a percentage of total household income. The righthand side looks at couples who have a "traditional division of labor" in hours, defined as the male partner working at least ten hours and the female partner either not working or working less than half as many hours. The height of the bar represents the percentage of each for married couples minus the percentage for cohabiting couples.

is in part justified by the fact that the division of housing is especially likely to favor the mother. Since child custody is often given to mothers, the family home is also more often allocated to the mother as well (Weitzman, 1981), irrespective of the specific legal regime. The mother may additionally be granted usage rights of the home for some period of time, even if it is to be equitably divided upon sale.

The high rates of assignation of the marital home to wives as well as the difficulty in hiding or disposing of it prior to official divorce makes homes a particularly important shared asset.[14] Homeownership plus marriage thus creates a state-contingent contract through which a man can put at stake some resources in case of a divorce. Alternatives, e.g., divorce insurance, are scant since private markets would be riddled with private information problems.[15] Moreover, housing has the advantage of offering other useful services, while also being ingrained in US culture—a part of the "American Dream" (Goodman and Mayer, 2018). A quote that has been attributed to various celebrities goes, "Instead of getting married again, I'm going to find a woman I don't like and just give her a house," demonstrating the centrality of homeownership to American marriage and divorce "traditions."[16]

Data indeed shows an intimate link between home purchase and marriage. Figure 2 examines homeownership rates quarterly for men aged 21-35 around the time that they marry or have children. Home

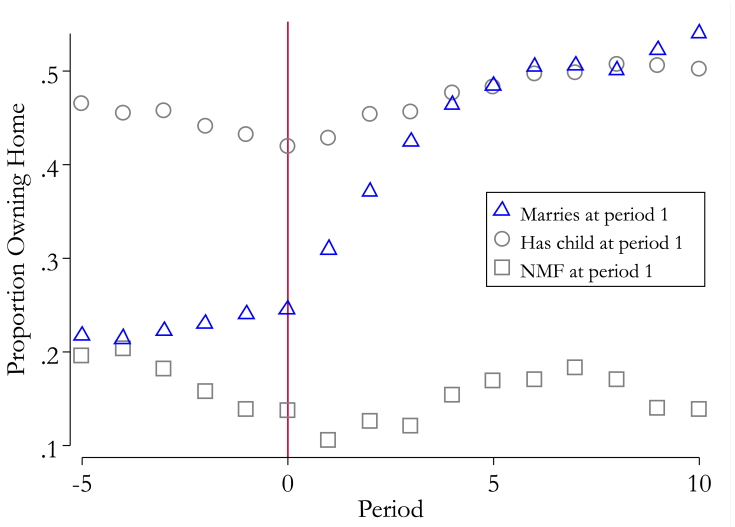
[14]Note that this does not mean that cohabiting couples cannot purchase a home jointly, but the equity each puts in remains their own property. Home purchase cannot be used to bind one member of the couple's resources as joint property. In marriage, even if one spouse pays for every single mortgage payment, the home is still joint property.

[15]Divorce insurance would suffer from clear adverse selection and moral hazard problems. Joint annuities could be used for this purpose but are also not highly present in the market due to imperfect information issues. Prenuptial agreements are complex and sometimes thrown away by divorce courts, especially when they stray too far from what one is legally entitled to.

[16]Most reliably attributed to American humorist Lewis Gizzard (Sherrin, 2008), the quote has also been linked to Rod Stewart and Willie Nelson.

acquisition rates spike precipitously for those in the period immediately following marriage, going from around 25% homeownership to 50% within six quarters. For a different life event, though, having children, we see no such spike in home acquisition. Rather than acquiring a home to accommodate a growing family, we see that individuals in fact generally have high rates of homeownership *before* having children. When we specifically look at those who have children outside of marriage, non-marital fertility (NMF), we see low rates of homeownership that do not increase after the birth of a child. This is suggestive evidence that the contract of marriage and homeownership are closely intertwined, which our model explains for the first time.

Figure 2: Association Between Marriage and Home Purchase



Notes: Data uses the 2008 Survey of Income and Program Participation. It restricts the sample to men who enter the first wave without a previous life event (marriage or birth) and for whom we observe such a life event during the subsequent 15 waves. The wave of the event is normalized to 1 and then average homeownership is charted in each wave before and after that point. "NMF" indicates non-marital fertility, which here is individuals who have a child but do not marry over the course of the data.

Thus, in the following section, we will focus on shocks to housing prices at the moment of marriage as a proxy for accessing a joint savings vehicle for the couple.

3.2 Homeownership as Collateral

Our model predicts that access to a joint savings vehicle should have a causal impact on how much each partner invests in public goods, such as children, versus their future career. We can measure specialization via men's and women's work hours and resulting wages, and proxy public goods with the number of children and their human capital.

Of course, if we looked at the difference in these outcomes between homeowners and non-homeowners, we might be identifying selection, rather than causality: those that wish to invest more in children might choose to buy homes as one such input. Therefore, we need a source of exogenous variation in homeownership. We therefore use idiosyncratic variation in housing prices at the time of marriage, while controlling for current housing prices. Our hypothesis is that lower housing price at the moment of marriage would make the couple more likely to start their marital life as owners.

Our data source is the American Community Survey from 2008-2014. This cross-sectional survey has the advantage of including the age at first marriage, from which we can derive the year in which individuals married. We restrict our sample to households where it is one individual's first marriage and where the marriage occurred between 1991 and 2014. We merge this database by year of marriage and state of residence to the Federal Housing Finance Agency's housing price index (HPI) based on purchase-only data. The data are available at a quarterly frequency and by state, for which we average over all quarters in a year to obtain our annual index. We choose to use state data because individuals are less likely to be able to avoid price shocks at the state-level, since changing state is very costly (compared to changing county if the variation were more highly localized). Importantly, our results are robust to using variation at the MSA level instead, as well as using the state of birth rather than the current state in order to eliminate any possible selection. We also show an alternate strategy using an instrument for housing prices to control for possibly correlated local economic factors.

Housing prices and rental prices are clearly related, but housing prices tend to be much more volatile. Whereas rental prices tend to change relatively smoothly with cost of living, housing prices can exhibit volatile "boom and bust" cycles. We can demonstrate this using data on state-level rental prices from the Bureau of Economic Analysis. Unfortunately, this data is only available starting in 2008, and thus cannot be used in our main regressions. However, we can examine how rental and homeownership prices co-move during this period, to provide further insight into the source of variation in our data. , we can employ a few years of data where we have, at the state level, and compare rental prices and purchase prices. In order to focus on the type of variation we will employ in our analysis, we run each panel against year and state fixed effects and compare the residuals for both series. Figure 3 shows how the residuals from the rental price index are much smaller than those from the purchase price index, using four large states—California, Texas, Illinois, and Florida—as examples. After controlling for the national trends, rental cycles are largely smooth, whereas state rental prices still exhibit considerable variation. The residuals of the two series do not appear to co-move substantially. To make this point more generally, we graph each state-year data-point for the residualized housing and rental prices against one another in Figure 4, demonstrating that there is little correlation between the two series. This suggests that our housing price index measure will capture variation beyond those shocks that would affect renters.

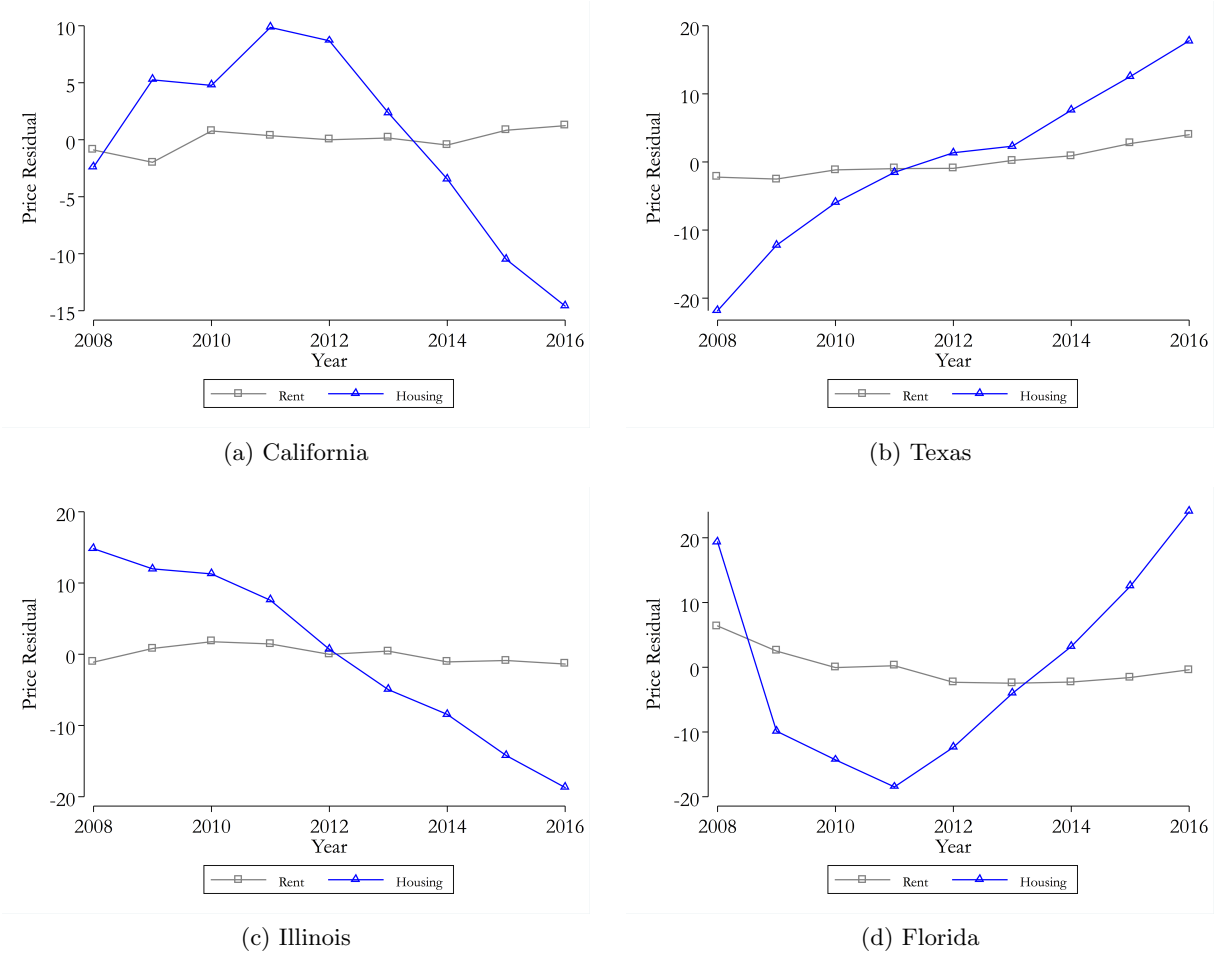
Importantly, a higher HPI in the year of marriage is expected to lead to *lower* homeownership, and thus lower the households' capacity to save jointly, per our model's predictions. For ease of interpretation, we thus regress on the negative of the HPI so that a higher value implies easier access to house purchases.

Our general empirical strategy will consist of estimating the following equation:

$$Y_{ismt} = \beta\left(-HPI_{sm}\right) + \eta_s + \nu_m + \delta_t + \gamma\, X_i + \psi\, HPI_{st} + \varepsilon_{ismt} \tag{4}$$

where the outcome of interest of a household i, in state s, married in year m and observed in year t (which is by definition post marriage) in the ACS is correlated with the household price index that was in place at the time of marriage m in the state where they currently reside s. Given that states may differ in many ways in addition to the evolution of their price index, we include fixed effects for each state. We also include fixed effects for each year of marriage m, to account for other macroeconomic factors and demographic trends at that time, and the survey year t. To rule out that correlation with current housing prices (which may affect

Figure 3: Comparison of rental and housing price index residuals by state

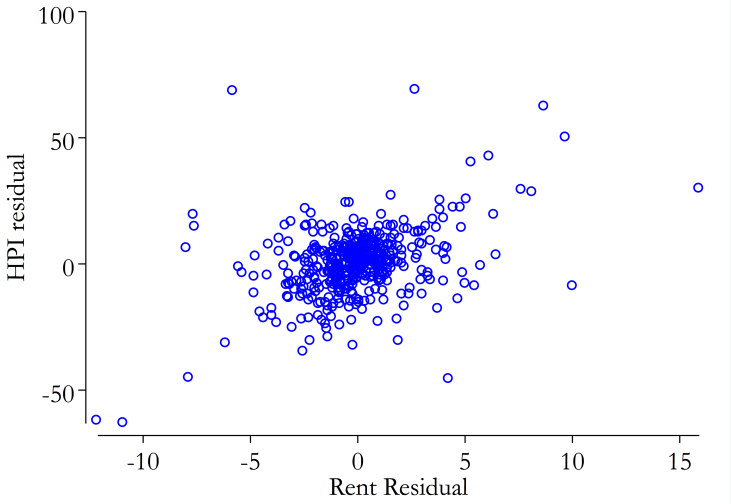


Notes: Housing price index from the Federal Housing Finance Agency based on purchase-only data. Rental price index from the Bureau of Economic Analysis. Both series represent the residuals of the data against year fixed effects and state fixed effects.

these outcomes) drives our effects, we additionally control for the *current* housing price index, which varies by both state and survey year. We include, depending on the specification, some controls such as the age of the married individual, their gender, and their educational attainment.

We initially demonstrate that lower HPI at the time of marriage is indeed linked to higher homeownership at the time of the survey. We then examine the hours worked of the a couple as a way to see whether investment is altered, as our model directly predicts women who invest more in household public goods will decrease their work investments accordingly. To capture specialization, we look at women's labor supply relative to men's, as well as a measure of the "outcome" of their investment choices, wages. Then, to proxy for public goods, we use the number of own children in the household and the fraction of the children in the household who are in a grade below what their age would suggest, as an indication of child "quality". Finally, we examine divorce. Although our model's predictions about divorce are somewhat ambiguous, they can be interpreted in a less stylized model as separation rates being lower for couples who own homes.

Figure 4: Comparison of rental and housing price index residuals across all states



Notes: Housing price index from the Federal Housing Finance Agency based on purchase-only data. Rental price index from the Bureau of Economic Analysis. Both series represent the residuals of the data against year fixed effects and state fixed effects.

Because our analysis requires us to condition on marriage (because we can only assign a HPI for the year of the marriage if a couple has entered into a marital union), one might worry selection into marriage could affect our results. Our model predicts that access to the commitment technology could affect the choice to marry in the first place, and housing prices could impact that access. Such selection would actually limit our capacity to find support for our model, since, in periods of lower housing prices, we would then see "worse" couples enter marriage. This would thus lead to an underestimate of the benefits of lower housing prices for child quality. We document this by running Equation (4) with educational attainment of individuals on the left-hand side. We find that a lower HPI at the year of marriage is correlated with married couples having fewer years of education, see Table B.1. This provides empirical support that the selection is likely to work against us finding the pattern predicted by our model.[17]

Effect of Housing Prices on Homeownership We first show that our right-hand side variable indeed creates variation in the endogenous variable of interest, homeownership, in Table 1. We divided the price index by 100, implying that a change of 1 in our index corresponds to a decrease of 1 percent in housing prices. The results suggest that a decrease of 1 percent in the housing prices at the time of marriage increases the probability that the household owns a home in later surveys by about 3 percent. This is robust to the inclusion of a control for the year of the survey HPI and for additional controls as described before.

[17] Additionally, using this variation, we find no statistically significant relationship between the housing index and the aggregate number of marriages in a state-year, although the education analysis does suggest that who marries changes. These results are available upon request.

Table 1: Relationship between house price at marriage and homeownership

	Dependent variable: Own Home		
	(1)	(2)	(3)
-House Price Index	0.0273***	0.0277***	0.0324***
	(0.00546)	(0.00543)	(0.00615)
Year of Survey HPI	No	Yes	Yes
Additional Controls	No	No	Yes
Observations	3220736	3220736	3220736
R-Squared	0.0666	0.0666	0.124

Notes: Data uses individuals in the 2008-2014 ACS married within the last eighteen years. House Price Index represents state-level housing prices from the Federal Housing Finance Agency in the year of marriage. Housing prices in the current year are controlled for in columns (2) and (3). Fixed effects for the year of marriage, current year, and state are included in all specifications. Standard errors are clustered at the state level.

3.2.1 Reduced Form Impact of Housing Prices on Specialization and Public Goods

Effect of Housing Prices on Division of Labor Our model suggests that homeownership will enable the couple to have a more traditional division of labor within the household. We present these results in Table 2, inserting an interaction term for being female times the house price index to compare women's working hours to those of men's. We find that women who faced lower home prices at the time of marriage are less likely to work in the year of the survey relative to men and work fewer hours relative to men. The magnitudes are such that housing prices being lower by 1 percent at the time of marriage leads to a 1 percent lower probability of having worked last year for women and to about 0.8-0.9 more hours worked per week.

Importantly, our results show that on the intensive margin, the effect of lower HPI go in the opposite direction for men and women. For usual hours worked, the effect of decreased housing prices is positive and significant for men – higher hours – while the interaction effect is negative and significant (and the sum of the coefficients is negative). While income effects from home appreciation could potentially create a stronger labor supply effect for women versus for men, the effect would always go in the same direction. Instead, we see diverging labor supply responses between women and men, indicating that homeownership affects *division* of labor, consistent with our commitment - child investment story.

These results are consistent with increased household specialization when it is easier to purchase a home, which is one form of joint savings. In the context of our model, this could be interpreted as marriages being more secure due to the possession of joint marital assets, and thus women having less need to protect their own income through higher labor force participation.

In order to offer some sense of the magnitude of our coefficients, we can do a back-of-the-envelope calculation assuming that lower housing prices at the time of marriage only affect the probability that a household owns a home. This is probably too strong of an assumption but this allows us to put some upper bounds on our effects. If we are willing to make that assumption, we would conclude that being 10 percent more likely to own a home lowers the probability that the wife works by about 3 percent, increases the usual work hours of men by 1 while decreasing that of women by 2.5 hours. In other words, if a household goes from not owning a home to owning a home (in this calculation), male labor increases by 10 hours and female

Table 2: Relationship between house prices at marriage and spousal labor force participation

	Dependent variable:					
	Worked Last Year			Usual Hours Worked		
	(1)	(2)	(3)	(4)	(5)	(6)
-House Price Index	0.00370	0.00383	0.00343	0.418***	0.424***	0.409***
	(0.00256)	(0.00253)	(0.00266)	(0.127)	(0.126)	(0.117)
-HPI × female	-0.0134***	-0.0134***	-0.0108***	-1.335***	-1.335***	-1.186***
	(0.00383)	(0.00383)	(0.00355)	(0.258)	(0.258)	(0.249)
Year of Survey HPI	No	Yes	Yes	No	Yes	Yes
Additional Controls	No	No	Yes	No	No	Yes
Observations	3702212	3702212	3702212	3702212	3702212	3702212
R-Squared	0.0510	0.0510	0.100	0.114	0.114	0.163

Notes: Data uses individuals in the 2008-2014 ACS married within the last eighteen years. House Price Index represents state-level housing prices from the Federal Housing Finance Agency in the year of marriage. Housing prices in the current year are controlled for in columns (2), (3), (5) and (6). Fixed effects for the year of marriage, current year, and state are included in all specifications. Standard errors are clustered at the state level.

labor decreases by 25 hours, consistent with the story that owning a home will lead to a significant increase in division of labor.

One may be worried that the housing prices influence spousal labor supply through other channels. In particular, housing markets may be correlated with general economic conditions leading potentially to different reaction by gender. We explore this by running the same regression we did above but this time employing the unemployment rate at the time of marriage as the main explanatory variable. The results are presented in Panel A of Table 3. They show that unemployment at the moment of marriage does not appear to influence the probability that either men or women worked last year. Being married in a state and year where unemployment was high leads men to work fewer hours and women to work more. This would be consistent with an environment where as unemployment increases, men are squeezed out of the labor market and women must work more to ensure higher household income. Note however that high unemployment periods should correlate with low housing prices and thus that far from being likely to explain our main result, this suggest that it may be weakened by other economic conditions changing simultaneously. This is something we will explore below using an instrument.

However, this does not include the possibility that our results stem from wealth effects derived from purchasing a home in a low price market. We explore this by looking at the housing prices 3 years after the marriage in Panel B of Table 3. According to our framework, couples would need to provide commitment at entry into the relationship for this to play a relevant role in future decisions. We find that the impact of the housing price on labor supply of couples is significantly more muted 3 years after the entry into the relationship than at the moment of marriage. This appears to indicate that it is not any sort of wealth gain that has the diverging impact we document on spousal labor supply but that it appears to be related to conditions around the time of marriage.

Finally, we may think that high skill women may be facing particularly high costs of specialization and may thus only be willing to enter in such agreement if there are assets to "insure" her investments. The last

Table 3: Relationship between house prices at marriage and spousal labor force participation-additional tests

	Dependent variable:	
	Worked Last Year	Usual Hours Worked
	(1)	(2)
	Panel A: Unemployment	
Unemployment	-0.00108	-0.186***
	(0.000933)	(0.0373)
Unemp.×female	0.00195	0.313***
	(0.00159)	(0.0609)
Observations	3702212	3702212
R-Squared	0.100	0.163
	Panel B: Housing prices 3 years after marriage	
-House Price Index	-0.000682	0.159
	(0.00320)	(0.156)
-HPI × female	-0.00154	-0.574**
	(0.00450)	(0.263)
Observations	3644836	3644836
R-Squared	0.101	0.164
	Panel C: Only college-educated individuals	
-House Price Index	0.0157***	1.493***
	(0.00358)	(0.249)
-HPI × female	-0.0347***	-3.252***
	(0.00574)	(0.472)
Observations	1408667	1408667
R-Squared	0.0590	0.130
Year of Survey HPI	Yes	Yes
Additional Controls	Yes	Yes

Notes: Data uses individuals in the 2008-2014 ACS married within the last eighteen years. House Price Index represents state-level housing prices from the Federal Housing Finance Agency in the year of marriage. Housing prices in the current year are controlled for in all columns. Fixed effects for the year of marriage, current year, and state are included in all specifications. Standard errors are clustered at the state level. The last panel is restricted to individuals who report more than 12 years of schooling.

Table 4: Relationship between house prices at marriage and relative wages

	Dependent variable:					
	Wage (level)			Log hourly wage		
	(1)	(2)	(3)	(4)	(5)	(6)
-House Price Index	3680.0***	3727.6***	3721.6***	0.0184*	0.0195*	0.0186***
	(809.4)	(798.7)	(739.3)	(0.00978)	(0.00987)	(0.00553)
-HPI × female	-7858.3***	-7859.3***	-7063.3***	-0.0895***	-0.0895***	-0.0666***
	(992.1)	(992.2)	(961.9)	(0.0122)	(0.0122)	(0.0104)
Year of Survey HPI	No	Yes	Yes	No	Yes	Yes
Additional Controls	No	No	Yes	No	No	Yes
Observations	3702212	3702212	3702212	2900523	2900523	2900523
R-Squared	0.0756	0.0756	0.199	0.0728	0.0729	0.237

Notes: Data uses individuals in the 2008-2014 ACS married within the last eighteen years. House Price Index represents state-level housing prices from the Federal Housing Finance Agency in the year of marriage. Housing prices in the current year are controlled for in columns (2), (3), (5) and (6). Fixed effects for the year of marriage, current year, and state are included in all specifications. Standard errors are clustered at the state level.

panel of Table 3 shows that the response we have documented is much stronger for college-educated men and women than for the rest of the population. This lends credit to the fact that our results are not driven by other shocks but exactly by the channel that we identified.

Effect of Housing Prices on Wages As the model predicts an effect on women's future earning ability, we should also be able to see a change in wages. Moreover, if men are relieved from some of their responsibility to invest in household public goods by greater specialization, they should reap a benefit in wages. We test this piece directly in Table 4 by examining the impact of housing-price-induced homeownership on the relative wages of women versus men. We find that lower housing prices are associated with increases in male wage levels, but a negative and significant interaction term for women. The sum of the terms is also negative, indicating that women who married in lower housing price times and areas experienced lower wages.

Note, that although positive income effects may decrease hours, there is no reason they would be expected to increase male wages, or have a differential effect on male and female wages.

Our findings are consistent with evidence that having children decreases women's wages, while not affecting men's (e.g Adda et al., 2017; Kleven et al., 2017; Bronson et al., 2017; Angelov et al., 2016), but add evidence that women experience these declines more when they are in collateralized relationships, which provides greater insurance for specialization. In couples where buying a home was made easier, women's time is reallocated toward child investments but lower personal human capital accumulation, with the opposite holding for men. These results also provide one possible channel for the male marital wage premium—by offering a secure relationship through which gains to division of labor can be captured, men who marry are able to spend less time on home production and more time investing at work, thereby increasing their wages.

Effect of Housing Prices on Child Outcomes We now turn to measuring household public goods, Q, with two different proxies: whether the child is delayed in school progression and the number of children

Table 5: Relationship between house prices at marriage and child investment

	Grade Retention		Number of Children			
	(1)	(2)	(3)	(4)	(5)	(6)
-House Price Index	-0.00793***	-0.00796***	-0.00879***	0.0384*	0.0383*	0.0311
	(0.00233)	(0.00233)	(0.00254)	(0.0210)	(0.0210)	(0.0201)
Additional Controls	No	No	Yes	No	No	Yes
Observations	2428234	2428234	2428234	3702212	3702212	3702212
R-Squared	0.00869	0.00869	0.0232	0.0936	0.0936	0.134

Notes: Data uses individuals in the 2008-2014 ACS married within the last eighteen years. House Price Index represents state-level housing prices from the Federal Housing Finance Agency in the year of marriage. Housing prices in the current year are controlled for in columns (2), (3), (5) and (6). Fixed effects for the year of marriage, current year, and state as well as year of survey fixed effects are included in all specifications. Standard errors are clustered at the state level.

within the household.

We look at children below age 18 because this makes it more likely that they are the children of the marriage we are examining. The first outcome is only available for households that have children of school age, which implies that our sample size is smaller. Table 5 shows each outcome in two separate columns. The odd columns correspond to our baseline specification; and the even columns add to that additional controls. The table suggests that households that were in a favorable housing market in the year they were married also show some evidence of changes in child outcomes.

In the case of grade retention, we find that couples facing easier housing markets are less likely to see their kids repeat grades. A decrease of 1 percent in the housing price at the time of marriage leads to a decreased probability of having a child who is below the grade for his age by 0.8 percent. This could indicate a higher total time investment in each child, with children having higher human capital as a result.

Each child takes more time away from parents. Thus, our model predicts couples who are more insured against divorce will have larger Q, which can be done through both the number of children and the investment in each one. We find that facing a 1 percent lower housing price at marriage increases the number of children by 0.03.[18]

Finally, we also use the total labor supply of the couple as a way to measure the provision of public goods. We find, as shown in Appendix Table B.2, that being married when housing prices were lower implied less total labor supply from the couple, indicating potentially a higher provision of public goods.

The main threat to identification of these results is possible income effects resulting from housing appreciation when couples face an idiosyncratically low housing price at marriage compared to today's prices. Thus, we acknowledge that these results are suggestive only, but are nonetheless consistent with the predictions of our model.

[18]This outcome may not be well served by a linear model. We thus also estimated a Poisson Regression and found that the results are stronger when using that type of model. Specifically, the coefficient on $-HPI$ was found to be 0.038-0.044 with standard errors of about 0.015, thus leading to t-statistics above 2.45 in all specifications.

Robustness We now show that our results are robust to a variety of checks. Our main analysis uses state level variation in housing prices because mobility between states based on housing markets is less likely than mobility between metro areas. To check that our results hold with finer variation, in Appendix Table B.3 we use MSA-level HPI variation instead, and restrict our sample to MSAs only. Lower housing prices are associated with lower probability of grade retention and more children, although that result is no longer statistically significantly different from 0. We also find similar patterns for labor specialization with lower housing prices leading to more traditional gender roles. Thus, our results do not seem to be driven by the fact that we employ a geographic level that, in some cases, may include very different housing markets.

Even across states, one may worry that the state of residence is endogenous to the housing price index and that individuals who wish to marry, for example, locate in a state that has a lower price index. This should, as with the selection story, bias results against our hypothesis, but we are still cautious about migration. In Appendix Table B.4, we use the state of birth as the unit of analysis instead of the state of actual residence. We find extremely similar patterns in all outcomes. Our results for child investments are almost identical for grade retention and for number of children. Our results for work specialization are even stronger and more significant. This leads us to believe that selective migration is unlikely to explain the patterns we find above.

One could also worry that our results are in part driven by the housing collapse of the Great Recession. We exclude marriages contracted between 2008 and 2011 and find extremely similar results. Those are presented in Appendix Table B.5. We find similar results as for our main sample, suggesting that the variation we exploit goes well beyond that of the Great Recession.

We finally include year of marriage interacted with Census region dummies to try to capture any sort of cultural differences that could be impacting our result. This is extremely demanding on our empirical strategy because it reduces the analysis to within-region between states variation. Nevertheless, as shown in Appendix Table B.6, we find that the magnitudes of the coefficients are barely affected by the introduction of the additional controls. Our standard errors are weakened but the results for labor division remain very robust to this addition.

3.2.2 Instrumenting for Housing Prices

Finally, one could also be worried that the house price index is endogenous to demand conditions in the local housing market which would influence decisions at the moment of the marriage, or otherwise linked to economic conditions. We thus repeat our analysis instrumenting for housing price indexes using a strategy based on Palmer (2015) by exploiting the fact that there is a pattern of volatility in housing prices that is persistently different between locations in the United States. Some regions of the country are more subject to housing booms and busts than others. To measure this, we use the yearly price index (all transactions) from 1975 to 1995 to measure the variability in the housing price index. We calculate the standard deviation in the year-to-year fluctuation in the housing price and obtain a value of σ_i, housing volatility, for each state. We then use this volatility as a "multiplier" on the leave-one-out national average price changes, and add

Table 6: Relationship between house price index, homeownership and instrument

	Dependent variable: Own Home		
	(1)	(2)	(3)
-House Price Index	0.0560**	0.0563**	0.0828***
	(0.0230)	(0.0223)	(0.0229)
Year of Survey HPI	No	Yes	Yes
Additional Controls	No	No	Yes
Observations	2883502	2883502	2883502
R-Squared	0.0617	0.0617	0.121

Notes: Data uses individuals in the 2008-2014 ACS married within the last eighteen years. House Price Index represents state-level housing prices from the Federal Housing Finance Agency in the year of marriage. Housing prices in the current year are controlled for in the last two columns. Housing price is instrumented for by state-level housing amplitude as described above. Fixed effects for the year of marriage, current year, and state are included in all specifications. Standard errors are clustered at the state level.

these to the base price in each state. Formally, we construct a predicted house price index as:

$$\widehat{HPI_{it}} = HPI_{-i1996} + \sum_{k=1997}^{t} \sigma_i * (HPI_{-ik} - HPI_{-ik-1})$$

where HPI_{-ik} is the house price index in year k in all other states minus i (we weight the state-level price index by state level population). Thus, our predicted measure simply assumes that the house price index that a state experiences is the one experienced in the other states but amplified or not depending on its past variability. It should thus be exogenous to current local economic conditions since it does not depend on these factors in any way. The only way in which this instrument could be correlated with local economic shocks is if the variance we calculated in previous years reflect not only a sensitivity to house prices but also to other economic shocks and that these shocks are reflected in the national price index. Palmer (2015) conducts the analysis using time dummies instead of the national price index but the logic is very similar.[19]

The first stage is very strong between the instrument and the actual price index, as shown in the first two columns of Table 6. The F-test for columns (1) and (2) is around 8.8. We next show that the results presented in our paper are robust to instrumenting for the house price index using the above instrument. We focus on the results only with all controls but the elimination of these controls do not change in any significant way the results presented.

The last two columns of Table 6 confirm that the positive impact of low HPI on home-buying persists even with an instrumented price index. The magnitude is even larger than the one with the direct HPI, suggesting that a low price index may also be correlated with bad economic conditions, which dampened the effect.

Table 7's first panel repeats the analysis for labor force participation of men and women with the instrumented housing price index. It shows that the asymmetric reaction of men and women to the change

[19]We have obtained extremely similar results when simply interacting the σ_i by the house price index in other states in level because we include fixed effects, which implies that our instrument works as in first differences. We also have found that the weighting of the price index of the other states is not relevant. Similar results were obtained when using flat weights between states.

in the housing price remains even once we instrument the house price index. We continue to find that a favorable housing market at the moment of the marriage increases the traditional division of labor between spouses. In response to an exogenously cheap housing market, females work less while men work more. The coefficient for males is insignificant for the extensive margin but strongly positive for the intensive margin on hours, while the interaction term between female and HPI is always negative and significant. We also show in Appendix Table B.7 that the results for wage hold with the IV strategy.

The second panel indicates that when a couple faces an exogenously easier housing market at the moment of marriage, they are less likely to have children in the household who experienced grade retention and also to have more children, again confirming our results using HPI. The magnitudes are larger suggesting that unobserved economic conditions correlated with low housing prices were likely to negatively impact our child quality outcomes, as one might expect, since prices rise when the economy is performing well.

Table 7: Relationship between house prices at marriage and child investment and division of labor: Instrumented

	Dependent variable:					
	Worked Last Year			Usual Hours Worked		
	(1)	(2)	(3)	(4)	(5)	(6)
-House Price Index	0.0124**	0.0125**	0.0174**	-0.105	-0.101	0.239
	(0.00482)	(0.00493)	(0.00694)	(0.546)	(0.553)	(0.570)
-HPI × female	-0.0187***	-0.0187***	-0.0167***	-1.518***	-1.517***	-1.399***
	(0.00533)	(0.00533)	(0.00477)	(0.316)	(0.316)	(0.293)
Year of Survey HPI	No	Yes	Yes	No	Yes	Yes
Additional Controls	No	No	Yes	No	No	Yes
Observations	3330278	3330278	3330278	3330278	3330278	3330278
	Grade Retention			Number of Children		
	(1)	(2)	(3)	(4)		
-House Price Index	-0.0274***	-0.0275***	-0.0306***	0.227**	0.228**	0.191*
	(0.00787)	(0.00782)	(0.00851)	(0.106)	(0.106)	(0.105)
Year of Survey HPI	No	Yes	Yes	No	Yes	Yes
Additional Controls	No	No	Yes	No	No	Yes
Observations	2145451	2145451	2145451	3330278	3330278	3330278

Notes: Data uses individuals in the 2008-2014 ACS married within the last eighteen years. House Price Index represents state-level housing prices from the Federal Housing Finance Agency in the year of marriage, instrumented for by state-level housing amplitude using the methodology of Palmer (2015). Housing prices in the current year are controlled for in columns (2), (3), (5) and (6). Fixed effects for the year of marriage, current year, and state are included in all specifications. Standard errors are clustered at the state level.

3.2.3 Impact on Marital Stability

Finally, we examine the impact of easier home access on divorce. In our baseline model, divorce is unaffected but, conditional on marriage, access to a joint savings vehicle reduces the probability of renegotiating the marriage contract. When we allow for child utility to be experienced differently by parents within versus

Table 8: Relationship between house prices at marriage and divorce probability

	Dependent variable: Divorce Status					
	OLS			IV		
	(1)	(2)	(3)	(4)	(5)	(6)
-House Price Index	-0.00586	-0.00580	-0.00609*	-0.0467***	-0.0468***	-0.0506***
	(0.00351)	(0.00353)	(0.00364)	(0.0158)	(0.0158)	(0.0173)
Year of Survey HPI	No	Yes	Yes	No	Yes	Yes
Additional Controls	No	No	Yes	No	No	Yes
Observations	3665398	3665398	3665398	3299318	3299318	3299318
R-Squared	0.0295	0.0295	0.0409	0.0299	0.0299	0.0408

Notes: Data uses individuals in the 2008-2014 ACS married within the last eighteen years. House Price Index represents state-level housing prices from the Federal Housing Finance Agency in the year of marriage, with the last three columns instrumented using the approach in Palmer (2015). Housing prices in the current year are controlled for in columns (2), (3), (5) and (6). Fixed effects for the year of marriage, current year, and state are included in all specifications. Standard errors are clustered at the state level.

outside of marriage, the model predicts divorce itself will be lower for those who are able to purchase a home. Table 8 shows the impact of the home price index at the time of marriage on the probability that the person interviewed is found to be divorced at the time of the survey. The first column presents the OLS specification while the second presents results with instrumented HPI as in the sub-section above. These results confirm that divorce decreases with lower housing prices, particularly once we instrument for the housing price. The results suggest that facing a one percent decrease in the housing price in one's state of residence at the time of marriage decreases the probability that the person is currently divorced by 0.6 percentage points for the year of marriage and almost 5 percent once instrumented.

Together, the results on the relationship between housing prices and home purchase, parental time allocation, child quality, and divorce suggest that easier access to housing as a joint savings vehicle at the time of marriage has significant consequences on parental outcomes later on, inducing couples to take on more traditional division of labor and increasing the utility they receive from children (either through higher number of children or more human capital for each of them). This is very robust to a variety of alternative specifications and suggests that there is real power in collateralizing marriage contracts through housing.

4 Wealth as an increasing source of stratification

We now return to the idea that marriage has been declining over time in the United States. Our model also predicts that since access to a joint savings vehicle like a family home allows better division of labor and more child quality, such access would increase marriage attractiveness. Has the decline in marriage differed for people with assets?

Although it is difficult to get asset-holding in data that spans a long period of time, the US Census allows us to measure marriage rates by homeownership, which we have argued is an important asset for American families. We see in Figure 5 that the decline in ever marrying (we restrict our age range between 30-50) has been experienced by those who rent homes much more than people who own. And, going back to

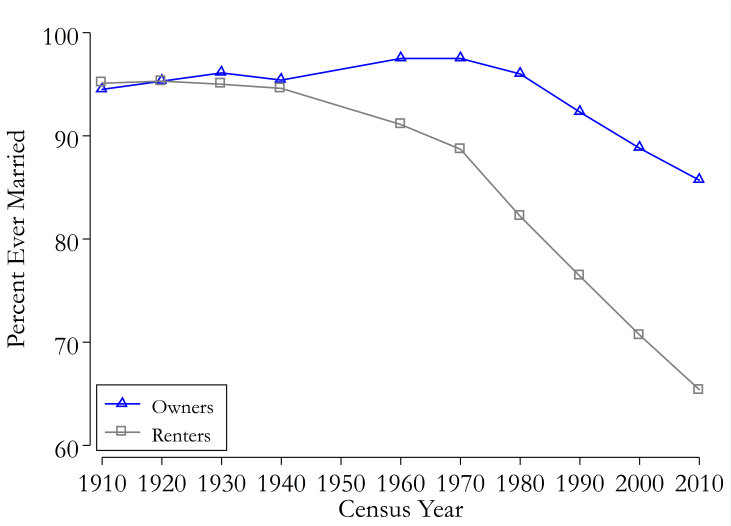
Table 9: Convergence Between Marriage and Cohabitation Contract

	Pre-1970		Today	
	Marriage	Cohabitation	Marriage	Cohabitation
Mutual consent to separate required	✓			
Income sharing upon separation	✓		✓	✓
Parental rights for father	✓		✓	✓
Asset division upon separation	✓		✓	

Notes: Assumes cohabitation with children. Unilateral separation from marriage was introduced at the state level in the 1960s and 1970s (see Voena 2015). Parental rights for non-marital fathers and income sharing (child support) was introduced in the 1990s as part of welfare reform (see Rossin-Slater 2016).

the early part of the 20th century, there was in fact no relationship between homeownership and marriage rates, whereas there is quite a strong relationship today. Obviously, homeownership may be correlated with multiple characteristics, but in Lafortune and Low (2017), we demonstrate that the stylized fact of lower marriage rates for people with lower assets holds even conditioning on wages, education, and race.[20]

Figure 5: Rates of Ever Married by Home Ownership Status



Notes: Rates of individuals age 30-50 ever being married by whether they live in an owned or rented home, from US Census data from 1910 - 2010. Homeownership is measured for the household head, so not necessarily the individual in question.

This change in the importance of assets in marriage appears to match changes in the legal environment that made marriage weaker except for those with assets. Table 9 shows how the marriage and cohabitation contracts have increased their similarity over the last 50 years, leaving assets division as the remaining separator. With the introduction of unilateral divorce in the 1970s and parental rights and responsibilities for non-marital fathers in the 1990s, the marriage and cohabitation contracts became more similar in all regards except for the presumed "jointness" of any assets acquired during the relationship.

[20]To do this, we used the panel nature of the Survey of Income and Program Participation (SIPP) to show that single individuals who have more assets in the first wave are more likely to marry in the subsequent periods.

Proposition 4 suggests that assets will become a stronger determinant of marriage as the marriage contract is weakened relative to alternatives. The state-year variation in the policy changes outlined in Table 9 provides an opportunity to test this directly, using quasi-exogenous variation in the specific timing of policy adoption. In particular, we focus on the introduction of unilateral divorce and paternity enforcement for non-marital fathers. While there were other accompanying policy and social changes that weakened marriage and strengthened cohabitation,[21] we focus on these two because there is state-level variation in the roll-out of these policies, which can be used for identification.

Unilateral divorce was passed in a series of state-level policy changes between 1967 and 1992, with the most states changing status between 1970 and 1980 (Friedberg, 1998). In our model, unilateral divorce would decrease the level of inter-temporal commitment possible in marriage. Mutual consent divorce is closer to the perfect commitment case than the imperfect commitment one. Division of income within marriage will never be renegotiable when both partners must consent to the divorce. It is possible that the division of income upon divorce would not be equal, but one can think that it is the possible outcome of a negotiation between spouses who must both agree to divorce. Unilateral divorce, then, will be more similar to the case of imperfect commitment. Courts will determine the way resources are shared ex-post and one partner can trigger the divorce procedure, forcing the other partner to renegotiate the sharing rule within marriage.

Enforcement of financial responsibilities for non-marital fathers was increased rapidly during the welfare reform in the 1990s, and made the income sharing guaranteed through marriage and non-marital fertility much more similar. We focus on one dimension of this enforcement for which we have state-level variation, namely establishing paternity at the hospital at the time of birth Rossin-Slater (2016). Once the father's paternity is formally established, it is easier for courts to enforce his financial obligation to support the child, even if the relationship between the mother and father dissolves. Establishing paternity at the hospital proved effective, because fathers typically attend births, and may be more willing to take on responsibility during this happy period. These "In Hospital Voluntary Paternity Establishment Programs" were thus not themselves a form of enforcement, but enabled enforcement of child support outside of marriage. And, they were rolled out in a staggered fashion by states throughout the 1990s.

We focus on the interaction between the policy changes and the impact of asset-holding on the propensity to marry, in panel data. The direct impact of the policies themselves may be difficult to identify due to the possibility of other correlated changes at the state-year level that may relate to marriage rates. However, to our knowledge ours is the only clear mechanism that would indicate a differential change in marriage rates by asset-holding.

4.1 Weakening the Marital Contract

We first examine whether a switch from mutual consent requirements to unilateral divorce led to an increased relationship between assets and marriage. We implement this empirical test using the PSID, since the PSID contains data for the time period when unilateral divorce laws were introduced, mainly in the

[21] Historically, marriage offered many benefits beyond those available through non-marital fertility, including paternal rights over children as well as legally mandated paternal financial support (Edlund, 2006), and divorce was difficult and extremely rare (Kay, 2000). Divorce rates began increasing in the 1960s, spurred on by both unilateral divorce laws and the introduction of "no fault" divorce (Kay, 2000). The increase in paternal rights and responsibilities outside of marriage has also been a broader trend, but was accelerated by welfare reform in the 1990s (Mayeri, 2016).

1970s. We follow Voena (2015)'s coding of unilateral divorce laws.

We want to measure how the decision to marry is impacted by the interaction of unilateral divorce laws and asset holding at the time when individuals are considering marriage. As the PSID does not regularly add new individuals (other than the children of panel participants), we need to choose a specific time to start looking at individuals. We choose to start looking at individuals at age 22, as this ensures we will cover the period of highest "marriage hazard" for men during the time period we analyze, when median age at first marriage ranged from 24 to 26. Our sample is thus all men who appear as unmarried at age 22 at any point during the sample timeframe. We attach the unilateral divorce status in the year they enter our sample in the individual's state of residence. We then follow them for a maximum of 12 years and measure whether they marry or not. Formally, we regress "ever marry" over the subsequent 12 years on state-of-residence unilateral divorce policy and asset-holding at age 22, controlling for state and year fixed effects.[22]

The equation being estimated is:

$$Evermarry_{ist} = \beta\, unilateral_{st} \times assets_i + \nu\, assets_i + \xi\, unilateral_{st} + \gamma\, X_i + \eta_s + \delta_t + \varepsilon_{ist} \tag{5}$$

on a panel of men i who were living in state s in year t which corresponds to the year they turned 22. We include individual-level controls as well as state-specific time trends being included in subsequent specifications.

We designate asset-holding individuals based on asset income, which is more likely to indicate the types of financial assets that could be invested in a marital property.[23] Prior to 1975, asset income is measured most cleanly for heads of household, and with noise for non-heads. For non-heads prior to 1975, we must infer asset income based on the individual having non-labor income, but not being poor enough for the household to receive welfare transfers. From 1975 onward, asset income is not co-mingled with other types of income for non-heads. Our results are also extremely consistent if we use the asset-holding of the head of the household to proxy for all household members (which avoids changing the definition of asset-holding over time), since this would also likely be a strong indicator of the son being able to place a down payment on a home or save in other ways.

Table 10 shows that men who turned 22 in a state that had unilateral divorce saw an increased relationship between their asset holding and their probability of marrying within the next 12 years. The coefficient is significant at the 5 percent level. This aligns with our hypothesis that having assets allows marriage to retain value—through increased commitment and protection for the lower earning spouse—even in the presence of one-sided divorce decision-making. The effect size remains stable with the introduction of individual controls and state-specific time trends. Note that the main effect of assets is not significant, and in fact even switches signs as additional controls are introduced. This indicates that asset-holding provides *substitute* commitment for difficult divorce, and thus only matters once unilateral divorce is introduced. Thus, the relationship between asset-holding and marriage is a more recent phenomenon, linked to the decline in the security of the marital contract.

Returning to homeownership, while Figure 2 shows that today marriage and homeownership are closely

[22]The analysis is robust to other choices of entry points and time windows.

[23]For heads of household we can further restrict to only financial asset income, rather than farm or business income. For non-heads, we cannot restrict the type, but they are also less likely to receive income from a farm or business.

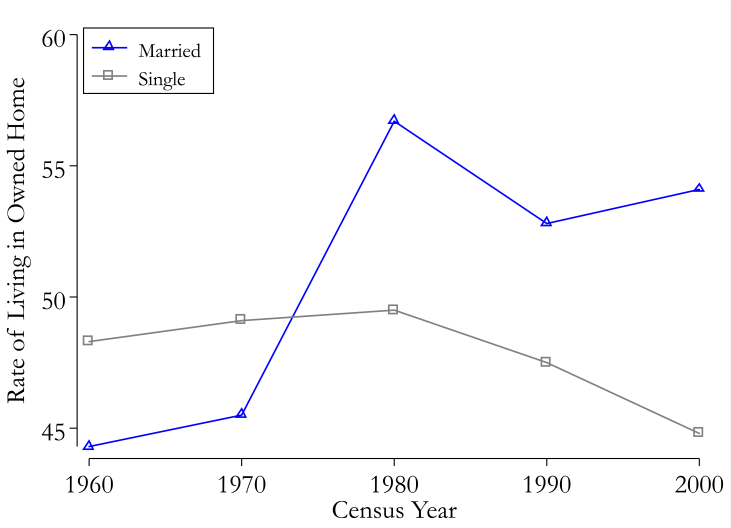
Table 10: Unilateral divorce laws and time to marriage, by asset status

	Dependent variable: Ever Married		
	(1)	(2)	(3)
Unilateral × Assets	0.143*	0.170**	0.164**
	(0.0734)	(0.0746)	(0.0723)
Own Assets	0.0829	-0.0366	-0.0255
	(0.0572)	(0.0641)	(0.0614)
Inc, educ, race controls	No	Yes	Yes
State specific time trend	No	No	Yes
Observations	1967	1463	1463
R-Squared	0.144	0.207	0.233

Notes: Data uses unmarried male individuals in the 1968-1993 Panel Study of Income Dynamics, starting at age 22. Outcomes are measured over a 12-year period. State and year fixed effects are included in all specifications. Standard errors are clustered at the state level.

related, data shows this strong relationship emerged exactly during the period when divorce was being liberalized, and therefore when the need for "collateral" in a now weakened contract was heightened. Figure 6 shows that homeownership rates for young married couples (18-30), increased from 40 percent in 1960 to 54 percent in 1980, at the same time the divorce rate rose. Meanwhile, the ownership rates for singles stayed constant. In other words, young couples have sought out homeownership increasingly as the security of the marriage contract has declined, suggesting an active demand for this source of collateral.

Figure 6: Rates of living in owned home over time, by marital status, ages 18-30



Notes: Rates of individuals living in a home that is owned (or being purchased) in the US Census from 1960 - 2000. Homeownership is measured for the household head, so not necessarily the individual in question. We include non-heads to ensure that selection between head status is not driving the results.

4.2 Strengthening the Non-Marital Fertility Contract

We now use data from the 1992, 1993, and 1996 waves of the Survey of Income and Program Participation (SIPP) to test whether the relationship between marriage and assets was affected by the introduction of IHVPE policies. IHVPE created a mechanism to enforce income sharing in the case a non-marital relationship dissolved, offering one protection previously only provided through marriage. Our model would predict this legal change would widen the marriage gap between high and low asset individuals.

As new individuals regularly enter the SIPP data, there is no need to designate a specific age to begin considering people. We thus assemble a data set encompassing all men aged 21-35 who enter the SIPP data unmarried. The SIPP data is quarterly, and for the period we use includes individuals in a panel for 9 or 12 waves (quarters). The panel itself is short, so we use the full time period for each individual, and naturally will thus have lower overall marriage rates than in the PSID analysis. We regress "ever married" (during the period we observe) on asset holding and the IHVPE policy in the initial period, controlling for state and year fixed effects, as well as age.

The equation being estimated is:

$$Evermarry_{ist} = \beta\, IHVPE_{st} \times assets_i + \nu\, assets_i + \xi\, IHVPE_{st} + \gamma\, X_i + \eta_s + \delta_t + \varepsilon_{ist} \tag{6}$$

Where s and t represent the state and year the individual i first appears in the data. We add individual-level controls as well as state-specific time trends in subsequent specifications.

Our data on IHVPE dates comes from Rossin-Slater (2016), and all of these policies were implemented in the 90s, during the period of welfare reform. Assets are specifically listed in the SIPP data, and we divide individuals into "asset holding," those with assets greater than zero, and not.[24]

Table 11 shows that individuals who entered the SIPP at a moment where their state of birth had implemented the IHVPE policy observed a greater correlation between assets and the probability of marriage than those who entered when the policy was not yet implemented. The effect size remains consistent even when state-specific time trends are accounted for. And, holding assets itself is positively associated with marriage rates in this time period, consistent with the earlier evidence in Lafortune and Low (2017). Since all states have implemented unilateral divorce over this period, this is consistent with the hypothesis that assets become relevant when marriage provides less commitment. This result highlights the role of assets in creating differential value of marriage, above and beyond that of non-marital fertility contracts, even as these alternative contracts are strengthened.

Overall, we find this evidence suggestive of an increasing role of assets and wealth in determining who enters into marriage and who does not, which is a clear corollary of our premise that a collateralized marriage is sought by individuals in response to the weakened commitment offered by the institution.

[24] We exclude homeownership from assets for two reasons: first, it is only measured for household heads, and secondly, homes owned pre-marriage are unlikely to be divided upon divorce, whereas financial assets that are used to purchase joint marital homes or save in other ways create shared marital property.

Table 11: Paternity establishment laws and marriage rates, by asset status

	Dependent variable: Ever Married		
	(1)	(2)	(3)
IHVPE × Assets	0.0383**	0.0367**	0.0359**
	(0.0172)	(0.0171)	(0.0168)
Owns Assets	0.0399***	0.0219***	0.0216***
	(0.00733)	(0.00703)	(0.00710)
Inc, race, and educ control	No	Yes	Yes
State-specific time trend	No	No	Yes
Observations	10670	10670	10670
R-Squared	0.0937	0.102	0.106

Notes: Data uses male individuals in the 1992, 1993, and 1996 Survey of Income and Program Participation age 21-35 who enter the data unmarried. IHVPE represents the adoption of in-hospital voluntary paternity establishment programs, shown by Rossin-Slater (2016) to decrease marriage rates. State and year fixed effects are included in all specifications, as are controls for age. Standard errors are clustered at the state level.

5 Conclusion

We present the first model on the role of assets in "collateralizing" the marriage contract. We demonstrate that a highly general model of investment in public good with limited commitment can generate the effect that savings into marital assets helps reduce the problems generated by limited commitment. Our model demonstrates that assets increase specialization and child investment precisely by strengthening the marriage contract, providing greater assurance to the partner investing more heavily in children.

We show empirical support for this model by using idiosyncratic variation in housing prices to show that those families who more easily purchase homes upon marriage specialize more within the household and appear to have higher levels of public goods, proxied by children. These results are robust to a number of alternative specifications, including instrumenting for housing prices. We then demonstrate that the introduction of unilateral divorce and increased ease of non-marital contracting made asset-holding a stronger predictor of marriage.

Our analysis brings the insight from standard economic theory that a limited contract space may destroy economic value to the area of the household for the first time. This is important, because of course there are many compelling reasons to allow easier exit from marriage, such as allowing women to leave abusive situations (Stevenson and Wolfers, 2006). However, the fact that reducing the contract security may have hampered specialization and other efficiency gains from marriage, and therefore eroded marriage's value for those not able use collateral to strengthen the contract, has perhaps not sufficiently been considered.

If it is true that marriage is valuable as a commitment device for investing in public goods, such as children, and those with access to collateral (via wealth accumulation or homeownership) have access to a stronger marriage contract, there are strong implications for inequality and poverty traps. Less access to wealth now means a lower ability to secure investments in the next generation, which will lead to strong intergenerational transmission of poverty. Thus, our paper provides microfoundations for an emerging "parenting gap," pointed to by Doepke and Zilibotti (2019) as a major driver of inequality. Moreover, access to wealth, and particularly

homeownership, has historically been differential along racial lines, highlighting a new axis of racial disparity. For example, Hamilton and Tippet (2015) demonstrate that while the white-black income gap is large, the white-black asset gap is *substantially* wider. Moreover, the homeownership gap may be even larger (Charles and Hurst, 2002), since on top of the disparity in financial assets, redlining historically limited the ability of non-white individuals to purchase homes. Our model suggests a mechanism linking this gap to a corresponding gap in marriage rates. Similarly, our model provides an underlying mechanism for the lower marital college premium Chiappori et al. (2017a) identifies for black women, which they link to lower human capital investments in children. Asset ownership and homeownership have not previously been considered as a driver of marital value, and thus the ability to insure child investments. This paper presents evidence that it could be an important factor, with stark policy and welfare implications.

Our model also suggests that access to the commitment technology allows one partner to specialize more in home production than the other. Weaker contracts would reduce the degree of insurance that partners obtain. Indeed, the "traditional" division of labor in the household collapsed over the same time period as the marriage contract was substantially weakened (Sayer, 2005). With this change, marriage rates have fallen, indicating its value may be related to the ability to specialize. By showing that marriage appears more valuable for those able to collateralize the contract we shed light on the economic value of marriage, and how its returns may be unevenly distributed, something that warrants further explanation in future work.

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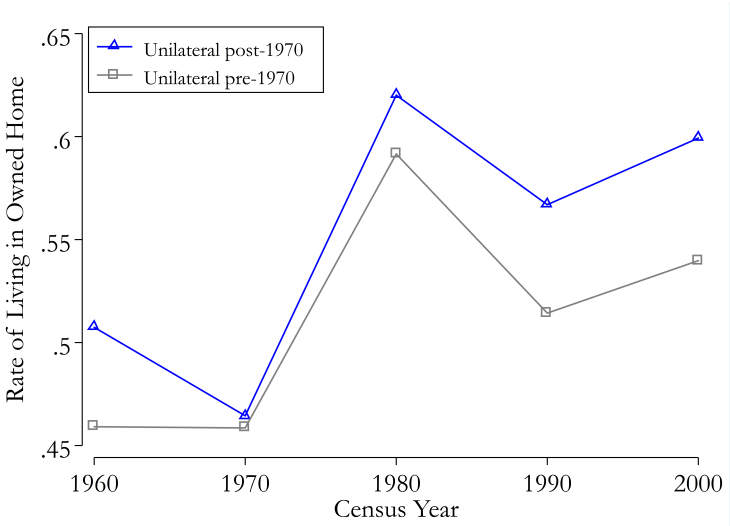
A Homeownership over time

Figure A.1: Rates of living in owned home by unilateral divorce laws, married individuals, ages 18-30



Notes: Rates of married individuals living in a home that is owned (or being purchased) in the US Census from 1960 - 2000, by state-level unilateral divorce laws. Pre-1970 states include all states who passed unilateral divorce laws before 1970, and post-1970 is states where laws were implemented post-1970 (but were indeed implemented). States that never implement unilateral divorce are excluded.

B Appendix Tables

Table B.1: Relationship between house prices at marriage and individual's years of education

	Dependent variable: Educational attainment			
	(1)	(2)	(3)	(4)
-House Price Index	-0.102*	-0.0993*	-0.504**	-0.503**
	(0.0549)	(0.0544)	(0.199)	(0.197)
Year of Survey HPI	No	Yes	No	Yes
Additional Controls	No	No	No	No
Observations	3220736	3220736	2883502	2883502
R-Squared	0.0174	0.0174	0.0161	0.0161

Notes: Data uses individuals in the 2008-2014 ACS married within the last eighteen years. House Price Index represents state-level housing prices from the Federal Housing Finance Agency in the year of marriage, with the last two columns instrumented using the approach in Palmer (2015). Housing prices in the current year are controlled for in columns (2) and (4). Fixed effects for the year of marriage, current year, and state are included in all specifications. Standard errors are clustered at the state level.

Table B.2: Relationship between house prices at marriage and total work hours of a couple

	OLS			IV		
	(1)	(2)	(3)	(4)	(5)	(6)
-House Price Index	-0.756***	-0.748***	-0.665***	-2.766**	-2.762**	-2.230*
	(0.211)	(0.209)	(0.231)	(1.184)	(1.190)	(1.260)
Year of Survey HPI	No	Yes	Yes	Yes	Yes	Yes
Additional Controls	No	No	Yes	No	No	Yes
Observations	1440093	1440093	1440093	1299414	1299414	1299414
R-Squared	0.0163	0.0163	0.0582	0.0163	0.0163	0.0593

Notes: Data uses all couples in the 2008-2014 ACS married within the last eighteen years. House Price Index represents state-level housing prices from the Federal Housing Finance Agency in the year of marriage, with the last three columns instrumented using the approach in Palmer (2015). Housing prices in the current year are controlled for in columns (2), (3), (5) and (6). Fixed effects for the year of marriage, current year, and state are included in all specifications. Standard errors are clustered at the state level.

Table B.3: Relationship between house prices at marriage and child investment and division of labor: MSA-level variation

	Dependent variable:			
	Worked Last Year		Usual Hours Worked	
	(1)	(2)	(3)	(4)
−House Price Index	0.00222	0.00284	0.425**	0.439**
	(0.00322)	(0.00333)	(0.168)	(0.166)
−HPI × female	-0.0101**	-0.00860*	-1.250***	-1.158***
	(0.00497)	(0.00479)	(0.249)	(0.237)
Additional Controls	No	Yes	No	Yes
Observations	1094095	1094095	1094095	1094095
R-Squared	0.0603	0.102	0.124	0.168
	Grade Retention		Number of Children	
	(1)	(2)	(3)	(4)
−House Price Index	-0.00339*	-0.00455**	0.0201	0.0167
	(0.00200)	(0.00210)	(0.0156)	(0.0160)
Additional Controls	No	Yes	No	Yes
Observations	775099	775099	1094095	1094095
R-Squared	0.00671	0.0288	0.124	0.153

Notes: Data uses individuals in the 2008-2014 ACS married within the last eighteen years who currently live in a MSA. House Price Index represents MSA-level housing prices from the Federal Housing Finance Agency in the year of marriage, while housing prices in the current year are controlled for. Fixed effects for the year of marriage and MSAs are included in all specifications. Standard errors are clustered at the MSA level.

Table B.4: Relationship between house prices at marriage and child investment and division of labor: State of birth

	Dependent variable:			
	Worked Last Year		Usual Hours Worked	
	(1)	(2)	(3)	(4)
−House Price Index	0.00794**	0.00415	0.724***	0.545***
	(0.00377)	(0.00341)	(0.196)	(0.181)
−HPI × female	-0.0156***	-0.0130***	-1.520***	-1.381***
	(0.00529)	(0.00475)	(0.362)	(0.334)
Additional Controls	No	Yes	No	Yes
Observations	2888992	2888992	2888992	2888992
R-Squared	0.0375	0.100	0.102	0.160
	Grade Retention		Number of Children	
	(1)	(2)	(3)	(4)
−House Price Index	-0.00657***	-0.00657***	0.0381*	0.0297
	(0.00215)	(0.00220)	(0.0209)	(0.0195)
Additional Controls	No	Yes	No	Yes
Observations	1867030	1867030	2888992	2888992
R-Squared	0.00864	0.0221	0.0905	0.137

Notes: Data uses individuals in the 2008-2014 ACS married within the last eighteen years. House Price Index represents state of birth level housing prices from the Federal Housing Finance Agency in the year of marriage, while housing prices in the current year are controlled for. Fixed effects for the year of marriage, current year, and state of birth are included in all specifications. Standard errors are clustered at the state level.

Table B.5: Relationship between house prices at marriage and child investment and division of labor: without 2008-2011

	Dependent variable:			
	Worked Last Year		Usual Hours Worked	
	(1)	(2)	(3)	(4)
−House Price Index	0.00203	0.00206	0.359***	0.367***
	(0.00221)	(0.00266)	(0.128)	(0.119)
−HPI × female	-0.00904**	-0.00647*	-1.100***	-0.958***
	(0.00361)	(0.00335)	(0.236)	(0.225)
Additional Controls	No	Yes	No	Yes
Observations	3063008	3063008	3063008	3063008
R-Squared	0.0527	0.101	0.118	0.167
	Grade Retention		Number of Children	
	(1)	(2)	(3)	(4)
−House Price Index	-0.00906***	-0.0102***	0.0280	0.0180
	(0.00266)	(0.00300)	(0.0252)	(0.0232)
Additional Controls	No	Yes	No	Yes
Observations	2102540	2102540	3063008	3063008
R-Squared	0.00883	0.0230	0.0719	0.126

Notes: Data uses individuals in the 2008-2014 ACS married within the last eighteen years. House Price Index represents state-level housing prices from the Federal Housing Finance Agency in the year of marriage, while housing prices in the current year are controlled for. We exclude all marriages contracted between 2008 and 2011. Fixed effects for the year of marriage, current year, and state are included in all specifications. Standard errors are clustered at the state level.

Table B.6: Relationship between house prices at marriage and child investment and division of labor: adding year of marriage × region dummies

	Dependent variable:			
	Worked Last Year		Usual Hours Worked	
	(1)	(2)	(3)	(4)
−House Price Index	0.00131	-0.0000502	0.349**	0.282**
	(0.00269)	(0.00239)	(0.160)	(0.139)
−HPI × female	-0.0134***	-0.0108***	-1.334***	-1.185***
	(0.00383)	(0.00355)	(0.258)	(0.248)
Year of Survey FEs	Yes	Yes	Yes	Yes
Additional Controls	No	Yes	No	Yes
Observations	3702212	3702212	3702212	3702212
R-Squared	0.0511	0.100	0.114	0.163
	Grade Retention		Number of Children	
	(1)	(2)	(3)	(4)
−House Price Index	-0.00378	-0.00416	0.0318	0.0299
	(0.00263)	(0.00272)	(0.0262)	(0.0258)
Additional Controls	No	Yes	No	Yes
Observations	2428234	2428234	3702212	3702212
R-Squared	0.00885	0.0234	0.0942	0.134

Notes: Data uses individuals in the 2008-2014 ACS married within the last eighteen years. House Price Index represents state-level housing prices from the Federal Housing Finance Agency in the year of marriage, while housing prices in the current year are controlled for. Fixed effects for the year of marriage, its interaction with Census region dummies, current year, and state are included in all specifications. Standard errors are clustered at the state level.

Table B.7: Relationship between house price index (instrumented) and wages

	Dependent variable:					
	Wage (level)			Log hourly wage		
	(1)	(2)	(3)	(4)	(5)	(6)
-House Price Index	3594.0	3619.5	6190.8***	-0.0627**	-0.0622**	0.00179
	(2427.5)	(2387.5)	(2128.0)	(0.0300)	(0.0303)	(0.0128)
-HPI × female	-8336.9***	-8329.6***	-7671.6***	-0.0885***	-0.0884***	-0.0685***
	(1003.4)	(1006.5)	(938.5)	(0.0137)	(0.0137)	(0.0117)
Year of Survey HPI	No	Yes	Yes	No	Yes	Yes
Additional Controls	No	No	Yes	No	No	Yes
Observations	3330278	3330278	3330278	2612991	2612991	2612991
R-Squared	0.0744	0.0744	0.198	0.0718	0.0718	0.237

Notes: Data uses individuals in the 2008-2014 ACS married within the last eighteen years. House Price Index represents state-level housing prices from the Federal Housing Finance Agency in the year of marriage, instrumented for by state-level housing amplitude using the methodology of Palmer (2015), while housing prices in the current year are controlled for. Fixed effects for the year of marriage, current year, and state are included in all specifications. Standard errors are clustered at the state level.