Marriage and Work among Prime Age Men

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PRELIMINARY AND INCOMPLETE. NOT FOR CIRCULATION.

Abstract

Married men work 20% more hours than men who have never been married, even after controlling for observables. Panel data regressions show that a significant part of this gap is accounted for by an increase in work in the run-up to marriage. Two potential explanations for this increase are: (i) men with positive wage realizations are more likely to marry; and (ii) marriage raises the expected marginal value of consumption. We quantify the relative importance of these channels using a structural life-cycle model of marriage and labor supply. Preliminary results suggest that a sizeable causal effect of marriage on male work is necessary for the model to be consistent with the data.

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1 Introduction

A longstanding empirical finding is that the labor supply of married women, especially those with children, tends to be lower and more elastic than that of women who have never been married. An immense literature has sought to understand this pattern and its implications; important contributions include Becker (1985), Becker (1988), Becker (1991), Goldin et al. (1992), Weil and Galor (1996), Goldin (2014), Doepke and Tertilt (2016).

In this paper we consider whether there are also important interactions between marital status and labor supply among *men*. We are motivated by a simple observation: in the cross section, married men work substantially more than men who have never been married. For example, among men age 20 - 54 in the Current Population Survey (CPS), currently married men work at least 30% more annual hours than men who have never been married, a gap which has remained roughly constant since 1975 (see Section 2). Since 1975 the magnitude of the marital gap in annual hours worked for men has been larger, albeit with the opposite sign, than for women.

The first contribution of this project is to document that a significant portion of the additional hours worked by married men is accounted for by an increase in work *before* marriage. In particular, we regress hours worked on a set of dummy variables for distance-from-marriage, as well as individual fixed effects, on panel data from the National Longitudinal Survey of Youth 1979 (NLSY79). The regressions show that men increase their hours by roughly 13% in the 10 years preceding marriage, and that this increase in hours persists for at least 10 years after marriage. With fixed effects included, these results raise the possibility that marriage itself, rather than persistent differences between married and never-married men, leads to higher hours of work.

Our second contribution is to quantitatively assess several potential explanations for *why* male hours of work increase prior to marriage. To do so, we develop a life-cycle model of male labor supply and saving, where men face uncertainty over wages, marital status and fertility. The model features two channels that could generate an increase in hours in the run-up to marriage. First, marriage and children change a mans income and expenses and, importantly, raise his marginal utility from consumption. This mouths-to-feed effect leads married men to work more when married and to increase their hours of work in anticipation of starting a family. The second channel is one of reverse causality through selection on transitory shocks. To account for this possibility, we allow men with higher wage shocks, who should be more willing to work, to experience a higher likelihood of marriage.

We find that a reasonably calibrated version of the model is able to generate marriage-related hours dynamics observed in the data, but only if the “mouths-to-feed” channel is sufficiently strong. In particular, when we discipline selection into marriage on the basis of wage shocks using state-level variation in wages, we find that selection on its own is too small to generate the observed increase in hours. Moreover, our empirical analyses show that prior to marriage, hours rise more than wages. If wage shocks were the sole driver of marriage, we would expect, given typical labor supply elasticities, that around the time of marriage wages would increase at least as much as hours. Additional evidence against the wage selection explanation comes from the behavior of men whose marriages are *preceded* by pregnancies. Responses in the NLSY79 indicate that pre-marital pregnancies are more likely to be unplanned, and thus more likely to be uncorrelated with wage shocks. Both the data and the model show that in marriages preceded by pregnancies male hours rise at least as much as in marriages where children arrive later.[1]

This project lies at the intersection of three literatures that are related but have nevertheless remained largely isolated from each other. The first is a series of reduced form analyses attempting to explain the "male marriage premium." Most of these focus on the difference in hourly wages between married and never-married men (see, e.g., Korenman and Neumark (1991), Cornwell and Rupert (1997), Ginther and Zavodny (2001), Antonovics and Town (2004), Rodgers III and Stratton (2010), Budig and Lim (2016), Glauber (2018), Killewald and Lundberg (2017), and a meta-analysis by de Linde Leonard and Stanley (2015)). On average these papers find that wages are about 10% higher for married men than for never-married men after controlling for observables, consistent with our empirical findings. The leading causal explanation for the male marriage premium in wages is that marriage increases their productivity by allowing them to specialize in market work rather than home production (Becker, 1991). The leading non-causal explanation is that men with higher wages are more likely to marry. Our view is that this literature has not reached a firm conclusion about which explanation is more important.[2] Our model includes both sorts of mechanisms: we account for specialization by allowing wages to increase with hours of work; and we account for selection by allowing the probability of marriage to depend on transitory wage shocks. Within our model, both mechanisms contribute to the increase in hourly wages around marriage, but specialization plays a somewhat larger role.

We are aware of two papers that emphasize differences in hours, rather than wages, between married and never-married men. Akerlof (1998) studies men in the NLSY79 and shows that after marriage they receive higher wages, work more and are less likely to abuse drugs and alcohol. Lundberg and Rose (2002) study men in the PSID and show that after marriage and the birth of children men receive higher wages and work more. However, neither study analyzes the time path of these variables, and thus do not show that the increase in hours and wages begin prior to marriage and persists for at least a decade into marriage. Furthermore, they do not attempt to quantify the channels that might generate this increase in hours, which is one of our main objectives.

[1]The hours response to pre-marital children is also evidence against marital selection along other labor market dimensions, such as the employment shocks discussed by Kaplan (2012).

[2]In a recent structural analysis, Pilossoph and Wee (2021) argue that the wage premium for married workers is due in part to different job search dynamics.

The second literature to which our paper contributes is an expanding set of structural analyses that explore the interactions of gender, marriage, children, and the labor market. Becker (1985) and Becker (1991) are foundational theoretical contributions, while Greenwood, Guner and Knowles (2003) and Attanasio, Low and Sánchez-Marcos (2005) are early dynamic quantitative exercises. Some of these papers examine only the labor supply decisions of couples, and so cannot speak to differences between married and single individuals (e.g., Knowles (2013), Blundell, Pistaferri and Saporta-Eksten (2016), Blundell, Pistaferri and Saporta-Eksten (2018), Alon, Coskun and Doepke (2018), Chiappori, Dias and Meghir (2018), and Ellieroth (2019)). Other papers focus on the role of female labor supply and for simplicity model male labor supply and earnings as exogenous (e.g. Greenwood et al. (2016) and Low et al. (2017)). There is also existing work featuring both marital dynamics and endogenous male labor supply, such as Guner, Kaygusuz and Ventura (2012*a*), Guner, Kaygusuz and Ventura (2012*b*), and Borella, De Nardi and Yang (2019). But to our knowledge none of these papers have attempted to explain male labor market behavior around the time of marriage.

Within this literature, the paper arguably most similar to ours is Siassi (2019), who seeks to explain marital gaps in earnings, income and wealth. In his model, three forces contribute to higher levels of per capita income and wealth for married households: positive selection into marriage based on productivity and wealth; tax benefits for married couples; and bequest motives that are stronger for households with children. Our analysis differs in several important ways. First, while Sisassi (2019) measures a single marital gap for men and women together, we emphasize that marriage and childbirth have qualitatively different effects on the labor market outcomes of men and women: on average, hours worked and earnings decline after marriage and childbirth for women but increase for men. Second, we calibrate our model to match the life-cycle patterns of family formation and labor market outcomes found in the data, while Siassi (2019) uses a stochastic aging framework. Third, while Siassi (2019) focuses on matching cross-sectional differences by marital status, we also assess individual transitions near the time of marriage using panel data. Fourth, we quantitatively discipline the magnitude of the selection-into-marriage channel using plausibly exogenous variation in state economic conditions.

Finally, we contribute to the nascent literature examining the secular decline in marriage and employment among blue-collar workers. In their review essay, Binder and Bound (2019) hypothesize that declining rates of marriage could discourage labor market participation. In a pair of event studies, Autor et al. (2019) find that negative labor demand shocks reduce both marriage and fertility, while Kearney and Wilson (2018) conclude that fracking booms increase fertility but not marriage. Our goals are somewhat different: we seek to understand how marriage and labor supply interact within a particular cohort (the NLSY79) of men, taking their labor and marriage markets as given. We view our findings as a necessary input into the larger project of understanding these fundamental, interconnected social transformations. Counterfactual experiments within our model suggest that, all else equal, if men in the NLSY79 cohort were unable to marry, they would on average work about 100 fewer hours each year.

The rest of the paper proceeds as follows. In section 2, we document that married men work more than single men and that their hours of work increase significantly before their first marriage. In section 3, we develop a model consistent with these facts, and in section 4 we describe how the parameters of the model are set. Our main results appear in section 5. There we show that the model reproduces the run-up in hours observed in the data, and argue that most of this increase is due to the mouths-to-feed effect. We consider the cross-sectional implications of our model in section 6. We conclude in section 7.

2 Empirical Evidence on Marriage and Male Labor Market Outcomes

We start by providing empirical evidence on the relationship between marriage and male labor market outcomes. First, we use repeated cross-sectional data from the Current Population Survey (CPS) to document a large and stable gap in hours worked between married and never-married men over the last four decades. Second, we use individual-level panel data from the NLSY79 to establish a direct relationship between marriage and changes in labor market outcomes.

2.1 Marriage and Work in Cross-Sectional Data

We use cross-sections for the years 1975 to 2019 taken from the CPS's Annual Social and Economic Supplement (ASEC). The ASEC includes information on both weekly hours and weeks worked in the previous calendar year, which allows us to construct a measure of annual hours worked. We restrict attention to the core working ages 20 - 54, and we include people with zero annual hours worked.

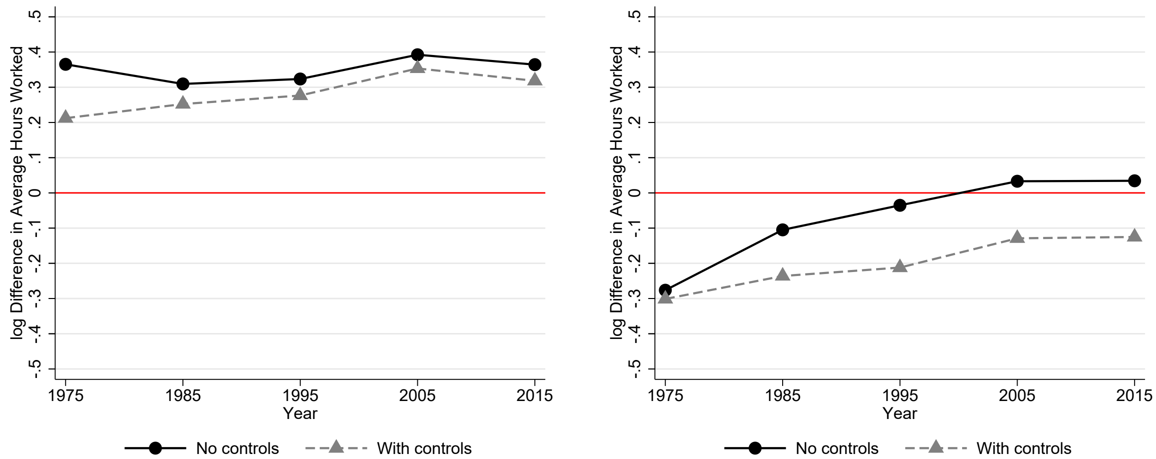
Figure 1 documents how annual hours of work differ by marital status. Our findings are consistent with a large number of earlier studies (see, e.g. Doepke and Tertilt 2016). Figure 1a shows results for men. The solid black line with circles shows the log ratio of average annual hours worked for currently married men relative to men who have never been married. Between 1975 and 2019, average annual hours worked by married men exceeded average hours of never married men by 31 to 39 log points. Most of the gap remains after controlling for then mens' education, age, race, and state of residence (the grey dashed line with triangles) .

Figure 1b shows results for women. In 1975, married women worked nearly 30 log points less than never-married women. By the 2000's, however, the gap in the raw data had completely disappeared. After controlling for women's observables, the gap is always negative, but even so by 2019 it was only 12 log points. Since 1985 the magnitude of the marital hours gap among men has been larger than that of women, even after controlling for observables.

Figure 1: Hours Worked by Marital Status: 1975–2019

(a) Men: log(Married / Never Married)

(b) Women: log(Married / Never Married)



Source: Men and women age 19 - 54 in the 1975–2019 waves of the CPS ASEC. Data points are 10-year centered averages, except for 1975, which averages across the years 1975-80. Annual hours worked are the product of usual weekly hours in the previous year and weeks worked in the previous year. The sample includes those with zero annual hours. The solid line plots the percent difference in average annual hours worked by currently married individuals versus individuals who have never been married. The dashed line plots the difference in the estimated coefficient for married versus never-married individuals in a regression of annual hours worked on marital status and controls for education, age, race, and state of residence.

A clear cross-sectional relationship between marital status and hours worked is also apparent when the CPS data is aggregated to the state level. Figure 2 plots the state share of men who are currently married against the state average annual hours worked. Figure 2a plots data from 1975 to 1979, the first 5 years for which the CPS micro data is available. The correlation between hours worked and share married is 0.524, and the slope is significantly positive. Figure 2b shows the same scatter plot for the years 2015 to 2019, the most recent 5 years of data prior to the large disruption from the pandemic. Even though both marriage and work has decreased in virtually every state, a similar positive relationship remains, with a correlation of 0.481.[3] Table 4 in Appendix A shows that this cross-state pattern continues to hold after controlling for age, education, and state fixed effects.

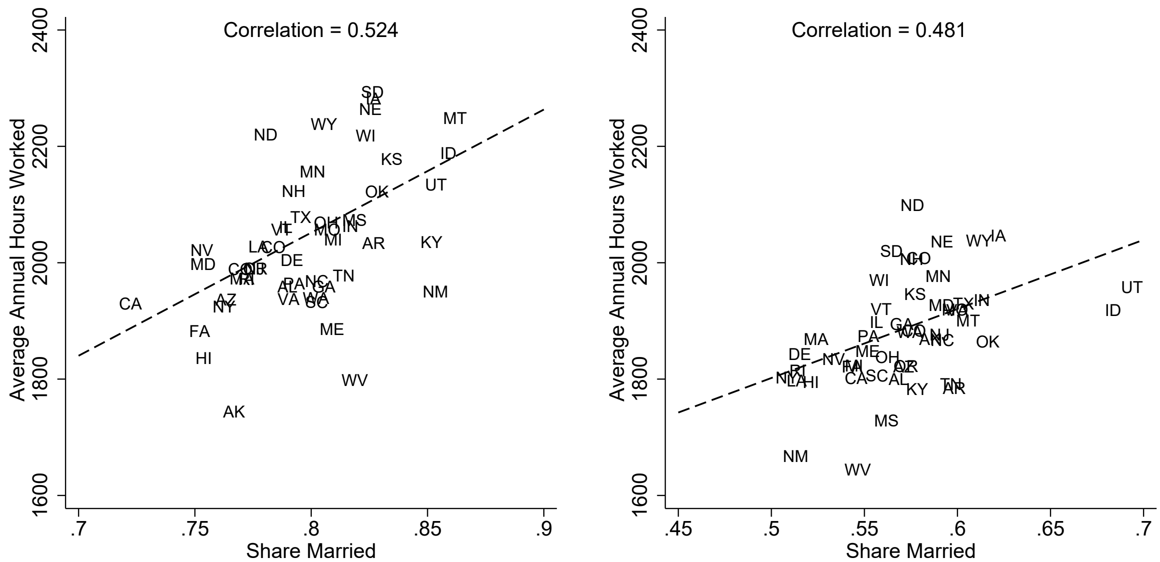
2.2 The Dynamics of Marriage and Work in Panel Data

Do individual men work more when they become married? Or, alternatively, do men who eventually marry always work more, even before they are married? To answer this question, we need to move beyond the cross-sectional comparisons in the preceding subsection and make use of panel data.

[3]In 2015 two noteworthy outliers are Utah and Idaho, with marriage rates of 69% and 68%, respectively. A likely contributing factor is that these two states have by far the largest population share that is Mormon, a religion which emphasizes the importance of marriage.

Figure 2: Cross-State Variation in Marriage and Hours Worked for Men

(a) 1975-1979 (b) 2015-2019



Source: Males age 19 - 54 in the CPS ASEC. Annual hours worked are the product of usual weekly hours in the previous year and weeks worked in the previous year. The sample includes those with zero annual hours. The dashed line is the line of best fit using OLS. Share married refers to the share of men in the sample who were currently married at the time of the survey.

For this we turn to the NLSY79, a longitudinal study of 12,686 individuals born between 1957 and 1964. Respondents were recruited and initially interviewed in 1979, when respondents were between 14 and 22 years old. They were then re-interviewed annually until 1994, then biennially afterward. The dataset contains a rich collection of information on family background, including detailed information on marriage and children, and labor market outcomes. Importantly, as of their initial interview 95% of male respondents in the NLSY79 had never been married, which allows us to observe changes in labor market outcomes around the date of marriage or the arrival of a child.[4]

We construct a "nearly-balanced" panel of men from the NLSY79 as follows. First, we drop the military over-sample portion of the survey. This leaves us with 5,579 individuals who were originally interviewed in 1979. Second, we restrict attention to men age 19 and older. Third, we restrict attention to men who we observe at age 50 or later, indicating that they remained in the survey for a substantial period of time. Fourth, among the remaining men, we restrict attention to those who were interviewed at least 20 times between 1979 and 2014 (out of a possible maximum of 26 interviews). These criteria balance our desire for a fairly complete

[4] Another candidate dataset with a long panel is the Panel Study of Income Dynamics. However, this dataset only consistently collects detailed information for household "heads" and "spouses." To the extent that younger individuals may live with parents, especially prior to marriage, this interviewing scheme limits our ability to study how labor market outcomes change in the years around marriage.

Table 1: Predictors of Male Annual Hours Worked in the NLSY79

	(1)	(2)	(3)
Constant	1708.1***	1757.6***	1825.5***
	(30.0)	(30.1)	(26.1)
Married	342.2***	295.4***	100.3***
	(10.4)	(10.4)	(13.1)
Separated / Widowed	69.4***	85.8***	−9.3
	(14.7)	(14.7)	(17.4)
Less than High School	–	−233.6***	–
		(14.6)	
Some College	–	29.7***	–
		(11.1)	
Bachelor's +	–	137.1***	–
		(10.9)	
Black	–	−293.6***	–
		(13.0)	
Hispanic	–	−153.7***	–
		(17.1)	
Age Cubic	*Y*	*Y*	*Y*
Year FEs	*Y*	*Y*	*Y*
Individual FEs			*Y*
R^2-adj	0.08	0.11	
N	45581	45581	45581

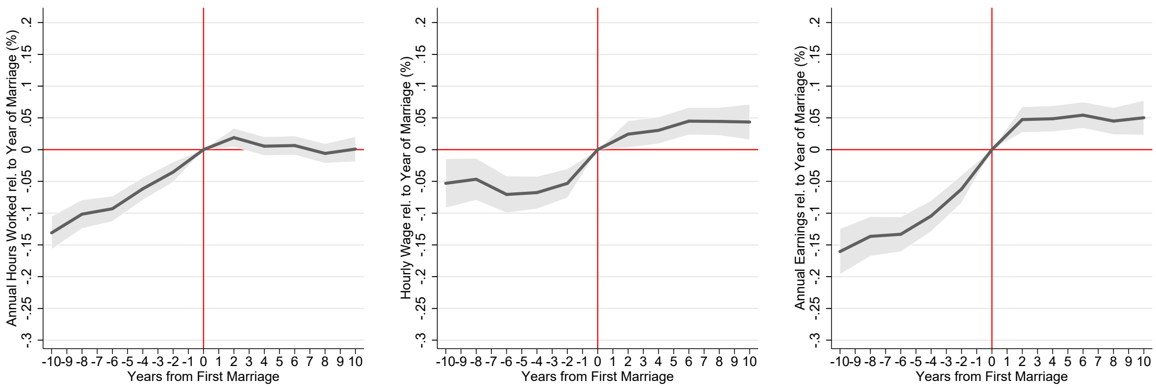
Source: Males age 19 - 54 in the NLSY79, see text for details. The sample includes those with zero annual hours.

life history against our need for a sufficiently large sample. This results in a final sample size of 2,731 men. Among this sample, we also exclude observations where men were currently enrolled in formal school; in particular, observations for men with a college degree do not enter into the analysis until age 23 or later.

To begin our panel analysis, we first regress annual hours worked on a dummy for current marital status, with and without controlling for individual fixed effects. The results are displayed in Table 1. Column (1) shows that the reference group of unmarried men work on average 1,708 hours per year. Married men of the same age and in the same calendar year, work 342 hours more, a difference of 20%. Column (2) shows that adding controls for the number of children and education reduces this discrepancy to 295 hours. Column (3) makes use of the panel aspect of the data to include individual fixed effects in the controls. This further reduces the coefficient on marital status, but it remains statistically significant and economically meaningful at 100 hours. Based on these results, we conclude that a sizable share of the difference in hours worked by marital status is due to individual changes in hours that coincide with changes in marital

Figure 3: Labor Market Dynamics in the Years around Marriage

(a) Annual Hours Worked (b) Hourly Wages (c) Annual Earnings



Source: Males age 19 - 54 in the NLSY79, see text for details. The solid line plots distance-from-marriage coefficients from the individual fixed effects regression equation (1). The shaded region corresponds to 95% confidence intervals.

status.

Next, we develop a fuller picture of how hours evolve around marriage by regressing annual hours on a sequence of dummies corresponding to the distance in years from the man's first marriage. Specifically, we run the following regression:

$$h_{i,t,d(i,t)} = \beta_d^{distance} + \beta_t^{year} + \beta_i^{individual} + \varepsilon_{i,t,d(i,t)} \tag{1}$$

The terms $\beta_i^{individual}$ and β_t^{year} are individual and year effects. The term $\beta_d^{distance}$, $10 \leq d \leq 10$, is a "distance-from-marriage" effect, with $d = -10$ indicating 10 years prior to the man's first marriage, and $d = 10$ indicating 10 years after the man's first marriage. When running the regression we exclude the coefficient at the time of marriage, $\beta_0^{distance}$, so that the reference group is men in the year they were first married. The regression excludes observations that are more than 10 years away from the man's year of first marriage in either direction. To control for age effects that are independent from marriage, the hours measure $h_{i,t,d(i,t)}$ equals annual hours worked divided by the average hours of married men of the same age. For example, a value of 1.1 at age 30 indicates that individual i's age-30 hours are 10% larger than the sample average for 30-year-old married men.

Figure 3a plots the estimated coefficients of $\beta_d^{distance}$. The figure shows that, relative to married men of the same age, annual hours increase 13% from ten years before marriage to two years after marriage, with a majority of this increase occurring in the six years leading up to marriage. Importantly, ten years after marriage mens' relative hours are essentially unchanged from the year they were married.[5] [6]

Figure 3b shows the results from an analogous regression of hourly wages on distance from marriage. Qualitatively, we observe a similar “S-shape” to the coefficients for hours worked, with a sharp increase in the years around marriage, and then a leveling off several years after marriage. However, we emphasize two notable differences from the hours coefficients. First, the magnitude of the increase is smaller for wages than for hours. From ten years before marriage until ten years after marriage, relative hourly wages only increase 10%, compared to 13% for hours; alternatively, the increase from the lowest coefficient before marriage to the highest coefficient after marriage is 12% for hourly wages, compared to 15% for hours. Second, much of the increase in hourly wages occurs *after* the increase in hours. In particular, roughly half of the increase in wages occurs in the year of marriage or later, while the increase in hours occurs almost entirely prior to marriage.

Figure 3c shows the results for annual earnings. The picture is very roughly the sum of the coefficients for annual hours and hourly wages in Figures 3a and 3b: earnings are essentially flat from ten years before marriage to six years before marriage, then increase 18% from six years before marriage to two years after marriage, and are essentially flat afterward. We emphasize that, in a pure accounting sense, the majority of the increase in annual earnings is attributable to an increase in hours worked, rather than wages. From this perspective, understanding the “hours premium” appears to be at least as important as understanding the “wage premium” emphasized in the existing literature (see Section 1).

Marital status is highly correlated with the presence of children. A natural question is to ask whether the changes in labor market outcomes that we have documented are more closely related to the onset of marriage or to the arrival of children. To investigate this, we run separate regressions for men whose first child appears before their first marriage, and for men whose first child appears after their first marriage. Figure 4 displays the results, with the solid blue line corresponding to men with pre-marital children and the dashed green line corresponding to men with post-marital children. The results indicate that both groups of men experience significant increases in hours around the time of their first marriage. One difference, however, is that the increase in hours is more abrupt for men with pre-marital children. For example, in the five years before marriage, relative hours for men with pre-marital children increase by 17%, compared with 6% for men with post-marital children. Because the NLSY79 data also

[5] Although we control for age by normalizing hours relative to the average among men of the same age, we have encountered concerns that our estimated distance-from-marriage coefficients may nevertheless reflect age effects. To address these concerns, Figure 15 in Appendix A.3 displays the results of a placebo test of the regressions in Figure 3, in which we randomly scramble the age at first marriage of men in the regression sample, and use this to compute a placebo distance-from-marriage measure. If the estimates in Figure 3 reflected the effect of age rather than distance from marriage, we would expect the placebo regression to yield similar estimates for the distance-from-marriage coefficients, since the labor market outcomes and age of men are identical in the two regressions. However, the placebo estimates are virtually all insignificant. This provides confidence that our original estimates are in fact reflecting the effect of distance from marriage.

[6] Figure 16 decompose the change in annual hours worked around marriage into changes in hours per workweek and changes in annual weeks worked. Each margin contributes roughly 50 percent of the increase in annual hours.

Figure 4: Hours Worked, Marriage, and Children

Source: Males age 19 - 54 in the NLSY79, see text for details. The solid line refers to men whose first child arrives before his first marriage ("pre-marital"). The dashed line refers to men whose first child arrives after his first marriage ("post-marital"). The lines plot distance-from-marriage coefficients from the individual fixed effects regression equation (1). The shaded regions correspond to 95% confidence intervals.

show that pre-marital pregnancies are more likely to be unplanned,[7] these results suggest that marriage and children have causal effects that encourage work.

2.3 Summary

The data show a strong positive relationship between marriage and market work for working age men. In the cross-section married men work substantially more than never-married men. This cross-sectional relationship has been fairly stable in the US since at least the mid 1970's, and remains after controlling for a host of observables. Panel data reveal that much of the cross-sectional difference in work by marital status is driven by increases in hours around the time when men first marry, especially during the five years prior to marriage.

One possible explanation for these patterns is that marriage leads men both to work more once they marry and to work more in anticipation of marriage. An alternative explanation is transitory selection, where events that increase hours of work create or coincide with an

[7]The NLSY79 asked whether pregnancies were unplanned in 1982 and every other year thereafter (even when the survey was annual). The responses to this question reveal that pre-marital pregrnancies are three times as likely to be unplanned, and half as likely to be planned. In particular, among married men with one child or no children but one on the way, 72% reported that their first child was planned, 16% reported the child was unplanned, and 12% reported the child was neither planned nor unplanned. Among never-married men, 36% reported that their first child was planned, 45% reported the child was unplanned, and 19% reported the child was neither planned nor unplanned.

increased likelihood of marriage. Because the two explanations have very different implications for how marriage affects male labor market outcomes, we would like to quantify the importance of each. The results presented here provide some clues. For example, the increase in average hours is larger than, and begins before, the well-documented increase in hourly wages that occur around marriage. This suggests that shocks to wages are not the the sole reason hours increase in the lead-up to marriage. A full quantitative assessment, however, requires a structural model.

3 Model

3.1 The Life Cycle

The model is a one-shot life-cycle model. Time, j, is discrete. At birth, men are endowed with an education, $e \in \{nc, c\}$ (non-college, or college). Non-college men enter the model at age $J_{nc} = 19$. College men are absent from the model during ages 19-22, and enter at age $J_c = 23$. Regardless of education, men retire exogenously at age J_R, and die at age J.

3.2 The Man's Wage Process

In each period before retirement, $j < J_R$, men supply labor hours h_j. Male earnings are given by

$$me_j = w_j h_j^{1+\zeta}, \tag{2}$$

where w_j determines a base hourly wage, and $h_j^{1+\zeta}$ introduces a "part time wage penalty" if $\zeta > 0$. The base wage w_j follows an AR-1 process with an age- and education-specific mean-shifter:

$$\log w_j = \alpha^w_{e,j} + \tilde{w}_j, \tag{3}$$

$$\tilde{w}_j = \rho^w_e \tilde{w}_{j-1} + \varepsilon^w_j, \tag{4}$$

$$\varepsilon^w_j \sim N(0, \sigma^\varepsilon_e). \tag{5}$$

In the notation above, and throughout the rest of this paper, superscripts are used to distinguish parameters, while subscripts indicate dependencies. For example, $\alpha^w_{e,j}$ is the mean-shifter for wages, w, for a man of age j and education e. Equations (4)–(5) give rise to the cumulative distribution function $F^w(\tilde{w}' \,|\, \tilde{w})$, which describes the distribution of the idiosyncratic wage shocks next period, $\tilde{w}'$, given the current shock $\tilde{w}$.

3.3 Family Structure and Family Dynamics

The structure of the man's family is described by the triple $f = (r, a, n)$. The first component, r, denotes relationship status. Men can be single ($r = sn$), in a relationship ($r = rl$), engaged ($r = en$), married ($r = mr$), or divorced ($r = dv$). The second component denotes the age of any children, $a \in \{0, yc, oc, gc\}$, corresponding to no children, young children (ages 0-5), older children (ages 6-18), and grown children, respectively. We distinguish between young and older children because younger children are more expensive, imposing higher formal childcare costs and discouraging spousal employment, as detailed in Sections 3.4.1 and 3.4.2. To simplify the model, we assume that all children in a household belong to the same age group. The third component denotes the number of children, $n = 0, 1, ..., \bar{n}$. As in Cubeddu and Ríos-Rull (2003), we treat family structure as an exogenous stochastic process, focusing instead on its effects. To allow for selection, we condition the relationship transition probabilities on the wage shock $\tilde{w}$.

3.3.1 Fertility Dynamics

A childless man ($n = 0$) of age j, education e, and relationship status r will have one (young) child next period with probability $\varphi^n_{0,r,e,j}$. As long as his children are young, additional offspring are possible. A man with $0 < n < \bar{n}$ young children will have $n+1$ children next period with probability $\varphi^n_{n,r,e,j}$ and n children with probability $1 - \varphi^n_{n,r,e,j}$. We assume that once young children age, a man does not have additional children. We assume further that divorced men have no additional children: $\varphi^n_{n,dv,e,j} = 0$.

Children age stochastically and all at the same time.[8] Young children, $a = yc$, evolve to older children, $a = oc$, with probability $\varphi^a_{yc,e,j}$ and older children evolve to grown children, $a = gc$, with probability $\varphi^a_{oc,e,j}$. We assume that in families with young children, the aging shock occurs after the fertility shock; this implies a newborn can age immediately into an older child. Being a grown child is an absorbing state.

Let $\phi^{an}_{a,n,r,e,j}(a', n')$ denote the probability that a man of age j with education e, relationship status r, and current child status (a, n) will have child status (a', n') next period. Collectively, our assumptions imply that:

$$\phi^{an}_{0,0,r,e,j}(yc, 1) = \varphi^n_{0,r,e,j}, \tag{6a}$$

$$\phi^{an}_{0,0,r,e,j}(0, 0) = 1 - \varphi^n_{0,r,e,j}, \tag{6b}$$

$$\phi^{an}_{yc,n,r,e,j}(oc, n+1) = \varphi^a_{yc,e,j} \cdot \varphi^n_{n,r,e,j}, \tag{6c}$$

$$\phi^{an}_{yc,n,r,e,j}(yc, n+1) = (1 - \varphi^a_{yc,e,j}) \cdot \varphi^n_{n,r,e,j}, \tag{6d}$$

$$\phi^{an}_{yc,n,r,e,j}(oc, n) = \varphi^a_{yc,e,j} \cdot (1 - \varphi^n_{n,r,e,j}), \tag{6e}$$

[8] This modeling choice simplifies the computation of the model by reducing the number of states in the child age space. It also reflects the uncertainty inherent in the costs of children, since there is variation ex-post in the time it takes for young children to mature into grown children.

$$\phi^{an}_{yc,n,r,e,j}(yc,n) = (1-\varphi^{a}_{yc,e,j}) \cdot (1-\varphi^{n}_{n,r,e,j}), \tag{6f}$$
$$\phi^{an}_{oc,n,r,e,j}(gc,n) = \varphi^{a}_{oc,e,j}, \tag{6g}$$
$$\phi^{an}_{oc,n,r,e,j}(oc,n) = 1-\varphi^{a}_{oc,e,j}, \tag{6h}$$
$$\phi^{an}_{gc,n,r,e,j}(gc,n) = 1. \tag{6i}$$

We assume that $\varphi^{n}_{n,r,e,j} = 0$, $\forall j \geq J_R - 2$, $\varphi^{a}_{yc,e,J_R-2} = 1$, and $\varphi^{a}_{oc,e,J_R-1} = 1$, which ensures that all children are grown by retirement.

3.3.2 Relationship Status

Because we do not observe the incidence of relationships in our data – we observe only whether an individual is married or has children – we must impose strong assumptions about how they evolve. In the model, individuals reach marriage in three ways. First, some men are married when they enter the model. Second, some men transition into marriage prior to the arrival of any children. Childless men advance up the "relationship ladder" as follows: single men enter a relationship with probability $\phi^{rl}_{e,j}(\tilde{w})$; men in a relationship become engaged with probability $\phi^{en}_{e}(\tilde{w})$, and engaged men marry with probability $\phi^{mr}_{e}(\tilde{w})$. The dependence of the transition probabilities on wages ($\tilde{w}$) allows for (positive) wage selection into marriage.[9] Third, a never-married man can have an out-of-wedlock birth, which makes marriage more likely; this "shotgun marriage" effect is motivated by the higher marriage rates observed in the first few years following an out-of-wedlock birth. We assume that a man with an out-of-wedlock birth faces "double jeopardy". Because of the birth, his relationship status advances one stage with probability ϕ^{owb}_{e}; should this "shotgun advancement" not occur, he still faces the "regular" probability of advancing faced by childless men. For simplicity we assume that only the first out-of-wedlock birth has this effect.

Married men divorce with probability $\phi^{dv}_{n,e,j}$. Divorce is an absorbing state, i.e., we rule out re-marriage. Finally, we assume that relationships are fixed once an individual reaches retirement.

This structure gives rise to the following transition probabilities for single men:

$$\Pr(r_j = rl \mid r_{j-1} = sn,\ n_j = 0) = \phi^{rl}_{e,j}(\tilde{w}), \tag{7a}$$
$$\Pr(r_j = sn \mid r_{j-1} = sn,\ n_j = 0) = 1 - \phi^{rl}_{e,j}(\tilde{w}), \tag{7b}$$
$$\Pr(r_j = rl \mid r_{j-1} = sn,\ n_j = 1,\ n_{j-1} = 0) = \phi^{owb}_{e} + \left(1-\phi^{owb}_{e}\right)\phi^{rl}_{e,j}(\tilde{w}), \tag{7c}$$
$$\Pr(r_j = sn \mid r_{j-1} = sn,\ n_j = 1,\ n_{j-1} = 0) = \left(1-\phi^{owb}_{e}\right)\left(1-\phi^{rl}_{e,j}(\tilde{w})\right), \tag{7d}$$
$$\Pr(r_j = rl \mid r_{j-1} = sn,\ n_j > 0,\ n_{j-1} > 0) = \phi^{rl}_{e,j}(\tilde{w}), \tag{7e}$$
$$\Pr(r_j = sn \mid r_{j-1} = sn,\ n_j > 0,\ n_{j-1} > 0) = 1 - \phi^{rl}_{e,j}(\tilde{w}), \tag{7f}$$

[9] Being defined as a zero-mean deviation, $\tilde{w}$ should have little effect on the average probability of marriage.

and the following probabilities for married and divorced men:

$$\Pr(r_j = dv \mid r_{j-1} = mr) = \phi^{dv}_{n,e,j}, \tag{8a}$$

$$\Pr(r_j = mr \mid r_{j-1} = mr) = 1 - \phi^{dv}_{n,e,j}, \tag{8b}$$

$$\Pr(r_j = dv \mid r_{j-1} = dv) = 1. \tag{8c}$$

The transition probabilities of men who are currently in a relationship or engaged take the same form as those of single men, with the term $\phi^{rl}_{e,j}(\tilde{w})$ replaced by $\phi^{en}_{e}(\tilde{w})$ or $\phi^{mr}_{e}(\tilde{w}_j)$ when the man is in a relationship or engaged, respectively. It bears noting that neither the probability of becoming engaged nor the probability of getting married vary with age: the age pattern of marriage depends solely by changes in the rate at which relationships form.

3.4 Family Structure and Financial Resources

Marriage and children affect a man's financial resources in four ways. First, in larger households consumption must be spread across more individuals. We capture this effect through the use of equivalence scales that convert total consumption to per capita amounts. Second, spouses can generate earnings or, if they stay home with young children, substitute for costly formal child care. Third, young children require expensive care. Finally, couples who divorce split their wealth in half. The possibility of such a split tends to reduce the husband's expected consumption, as he usually has the higher earnings.

3.4.1 Spousal Earnings

At the time that a man marries, J_m, his wife draws the permanent earnings shock

$$\tilde{s} \sim N(\rho^s_e \tilde{w}_{J_m}, \sigma^s_e). \tag{9}$$

This shock is potentially correlated with the man's idiosyncratic wage shock at the time of marriage, $\tilde{w}_{J_m}$; we will estimate ρ^s from the data. Equation (9) gives rise to the cumulative distribution function $F^s(\tilde{s}\,|\,\tilde{w})$.

Given $\tilde{s}$, spousal earnings in period $j \geq J_m$, se_j, follow a two-stage process. The first stage uses a logit model to determine whether the spouse works:

$$\mathbb{1}_{se_j > 0} = \begin{cases} 1 & \text{if } q_j < \frac{\kappa}{1+\kappa} \\ 0 & \text{otherwise} \end{cases}, \tag{10}$$

$$\kappa = \exp\left(\tilde{s} + \alpha^{s,1}_{a,e,j}\right), \tag{11}$$

$$q_j \sim U[0,1], \tag{12}$$

where $\mathbb{1}_{\mathcal{A}}$ is the indicator function for event $\mathcal{A}$. The second stage determines the earnings of spouses that work:

$$se_j = \mathbb{1}_{se_j>0} \cdot \exp\left(\log(\underline{s}) + \max\{0, \beta_e^s \tilde{s} + \alpha_{e,j}^{s,2}\}\right). \tag{13}$$

In the above equations, β_e^s is a wage scaling parameter, and $\alpha_{a,e,j}^{s,1}$ and $\alpha_{e,j}^{s,2}$ are mean-shifters that depend on the man's age and education. The mean-shifter for spousal participation also depends on the age of the children. Spouses with young children are least likely to work, spouses with no (or grown children) are mostly likely, and spouses with older childer fall in between. Families with non-working wives do not have to pay for childcare. The parameter $\underline{s}$, which places a lower bound on the earnings of working spouses, equals the cut-off we use to define working spouses in the data.

In our model of spousal earnings, wives with higher potential earnings are more likely to work. While a standard Tobit model would generate a similar relationship, we found that to fit the spousal earnings data well, we needed a more flexible specification. Even though the shock $\tilde{s}$ is permanent, wives will move in and out of employment as $\alpha_{a,e,j}^{s,1}$ and q_j vary over the life cycle.

3.4.2 Child Costs

Married couples must provide care to their non-adult children. If the wife does not work, $se_j = 0$, she provides the child care herself at no additional cost to the family. If the wife works, then the couple must purchase child care in the market, at a total cost of $n_j \chi_a se_j$. We assume that childcare costs are proportional to the number of children and to the wife's earnings. The cost factor χ_a depends on the childrens' age; older children ($a = oc$) are less expensive than younger children, and grown children ($a = gc$) impose no costs at all.

We assume that never-married and divorced men do not live with their children, and instead pay child support.[10] Child support is the fraction δ_a of the father's income. The parameter δ_a equals δ for young and older children, $a \in \{yc, oc\}$, and zero for grown children.

3.4.3 Divorce Costs

At the time of divorce, men lose half their assets. Divorced men also pay a fraction of their earnings, $n\delta_a$, in child support.

3.5 Preferences

Men have time-separable preferences over consumption and hours worked each period that vary with family structure, education and age:

[10] We assume that when a single father marries, his children join his new household.

$$u_{f,e,j}(c,h) = N_f \frac{(c/\eta_f)^{1-\gamma}}{1-\gamma} - \psi_{e,j} \frac{h^{1+1/\xi}}{1+1/\xi}, \tag{14}$$

with $\gamma, \eta > 0$. The parameter η_f is a household equivalence scale converting total household consumption, c, into the per capita amount consumed by the man. The shift term N_f captures the possibility that married men derive additional utility from the consumption of other household members. The labor disutility shifter ψ is a quadratic in age: $\psi_{e,j} = \psi_{e,0}(1 + \psi_{e,1} \cdot j + \psi_{e,2} \cdot j^2)$. Future utility is discounted at the rate $\beta \in (0,1)$.

3.6 Total income and Taxes

A household's total income, y, equals the sum of its earnings and capital income:

$$y_j = me_j + se_j + (R-1)k_j, \tag{15}$$

where k denotes the household's assets and R is the constant gross rate of return. It faces payroll and income taxes:

$$T(me+se,k) = \tau_{ss}(me+se) + T_{inc}(y), \tag{16}$$

$$T_{inc}(y) = \left[1 - \tau_1 (y/\bar{y})^{-\tau_2}\right] y, \tag{17}$$

where τ_{ss} is the payroll tax rate, $T_{inc}(y)$ is the income tax/transfer function, and $\bar{y}$ is mean income in the economy. We allow the parameters τ_1 and τ_2 to potentially depend on family structure, leading us to express taxes as $T(me+se,k;f)$ below.

3.7 Recursive Formulation

The state vector for this problem consists of the man's education level (e), assets (k), wage deviation ($\tilde{w}$), relationship status (r), age and number of children (a,n), and spousal earnings shocks ($\tilde{s}$ and q_j). We denote the non-existent spousal earnings shocks of unmarried men with the placeholders $\tilde{s}_{um}$ and q_{um}. We will continue to use $f = (r,a,n)$ as a compact index of family structure.

3.7.1 Single or in a relationship

The Bellman equations for working-age ($j < J_R$) men who are single and working-age men who are in a relationship are virtually identical. To see this, let $\mathbb{R}'(r)$ denote the set of relationship states that can be reached at time-$t+1$ when a man's time-t relationship status is r. We then have, for $r \in \{sn, rl\}$,[11]

$$V_j(e,k,\tilde{w},r,a,n,\tilde{s}_{um},q_{um}) = \max_{c,k',h} \Bigg\{ u_{f,e,j}(c,h) + \beta \int_{\tilde{w}'} \Bigg(\sum_{(a',n')} \phi^{an}_{a,n,r,e,j}(a',n') \tag{18}$$

$$\times \Bigg[\sum_{r' \in \mathbb{R}'(r)} \Pr_j \left(r' \,|\, r,n',n,\tilde{w}',e\right) V_{j+1}\left(e,k',\tilde{w}',r',a',n',\tilde{s}_{um},q_{um}\right) \Bigg] \Bigg) \, dF^w(\tilde{w}' \,|\, \tilde{w}) \Bigg\},$$

$$s.t. \quad c + k' \leq Rk + wh^{1+\zeta}(1 - n\delta_a) - T(wh^{1+\zeta}, k; f), \tag{19}$$

$$\log w = \alpha^w_{e,j} + \tilde{w}, \tag{20}$$

and the borrowing constraint

$$k' \geq k_{min}. \tag{21}$$

The man's expected continuation value depends on the evolution of his wage and family structure. With probability $\Pr_j \left(r' \,|\, r,n',n,\tilde{w}',e\right)$, his relationship status evolves from r to r'. Single men can stay single or enter a relationship, while men in a relationship can remain in the relationship or get engaged. The expectation is also taken over the possibility that the man fathers an additional child, and that his children age.

3.7.2 Engaged

The Bellman equation for a working-age engaged man, $r = en$, is

$$V_j(e,k,\tilde{w},en,a,n,\tilde{s}_{um},q_{um}) = \max_{c,k',h} \Bigg\{ u_{f,e,j}(c,h) + \beta \int_{\tilde{w}'} \Bigg(\sum_{(a',n')} \phi^{an}_{a,n,en,e,j}(a',n') \tag{22}$$

$$\times \Bigg[\Pr\left(en \,|\, en,n',n,\tilde{w}',e\right) V_{j+1}\left(e,k',\tilde{w}',en,a',n',\tilde{s}_{um},q_{um}\right) + \Pr\left(mr \,|\, en,n',n,\tilde{w}',e\right)$$

$$\times \int_{\tilde{s}} \int_{q'} V_{j+1}\left(e,k',\tilde{w}',mr,a',n',\tilde{s},q'\right) dF^q(q') \, dF^s(\tilde{s} \,|\, \tilde{w}') \Bigg] \Bigg) \, dF^w(\tilde{w}' \,|\, \tilde{w}) \Bigg\},$$

$s.t.$ equations (19)-(21).

The expected continuation value for an engaged man includes the possibility of marriage. In the event of marriage, the expectation must also taken over the potential earnings of the wife.

[11] Although the exposition can be simplified by using the conditional expectation operator, explicitly writing out the integrals illustrates the model's stochastic structure more clearly.

3.7.3 Married

The Bellman equation for a working-age married man, $r = mr$, is

$$V_j(e,k,\tilde{w},mr,a,n,\tilde{s},q) = \max_{c,k',h} \Bigg\{ u_{f,e,j}(c,h) \;+\; \beta \int_{\tilde{w}'} \Bigg(\sum_{(a',n')} \phi^{an}_{a,n,mr,e,j}(a',n') \tag{23}$$
$$\times \bigg[\phi^{dv}_{n,e,j} V_{j+1}\Big(e, \frac{1}{2}k', \tilde{w}', dv, a', n', \tilde{s}_{um}, q_{um}\Big)$$
$$+\; (1-\phi^{dv}_{n,e,j}) \int_{q'} V_{j+1}\big(e,k',\tilde{w}',mr,a',n',\tilde{s},q'\big)\, dF^q(q') \bigg] \Bigg)\, dF^w(\tilde{w}' \,|\, \tilde{w}) \Bigg\},$$
$$s.t. \quad c + k' \leq Rk + wh^{1+\zeta} + se(1-n\chi_a) - T(wh^{1+\zeta} + se, k; f), \tag{24}$$
$$se \text{ satisfies equations (10)-(13)}, \tag{25}$$
$$\text{equations (20)-(21)}.$$

With probability $\phi^d_{n,e,j}$ the man divorces, keeping half of the household assets. The spousal earnings shock for the divorced man, $\tilde{s}_{um}$, is a placeholder value. With probability $(1-\phi^d_{n,e,j})$ the man remains married. Recall that grown children ($a = gc$) impose no childcare costs.

3.7.4 Divorced

The Bellman equation for a working-age divorced man, $r = dv$, is

$$V_j(e,k,\tilde{w},dv,a,n,\tilde{s}_{um},q_{um},) = \max_{c,k',h} \Bigg\{ u_{f,e,j}(c,h) + \tag{26}$$
$$\beta \int_{\tilde{w}'} \Bigg(\sum_{(a')} \varphi^a_{a,e,j}(a')\, V_{j+1}\big(e,k',\tilde{w}',dv,a',n,\tilde{s}_{um},q_{um}\big) \Bigg)\, dF^w(\tilde{w}' \,|\, \tilde{w}) \Bigg\},$$
$$s.t. \quad \text{equations (19)-(21)}.$$

This reflects our assumptions that: (i) divorced men never remarry; and (ii) divorced men have no additional children.

3.7.5 Retired

Retired men ($j \geq J_R$) do not work, and if they are married their wives do not work. Their only income comes from their assets and from Social Security benefits received by the man ($b_{1,e}$) and his wife ($b_{2,e}$). All children are grown in retirement, implying that there are no childcare costs or child support payments due. Finally, relationships do not change in retirement, eliminating any uncertainty due to them. The resulting Bellman equation is completely deterministic:

$$V_j(e,k,r) = \max_{c,k'} \quad u_{f,e,j}(c,0) + \beta V_{j+1}(e,k',r), \tag{27}$$

$$s.t. \quad c + k' \leq Rk + b_{1,e} + b_{2,e}\mathbb{1}_{r=mr} - T(b_{1,e} + b_{2,e}\mathbb{1}_{r=mr}, k; f), \tag{28}$$

equation (21),

$$V_{J+1} \equiv 0. \tag{29}$$

4 Model Parameters

We set the parameters of our model in three steps. First, we set a number of parameters to values consistent with the broader literature. In the second step, we estimate the stochastic processes for fertility, relationships, wages and spousal earnings, which can be identified outside our model, from the data. While the principal dataset used in this step is the NLSY79, we also utilize state variation in the CPS. The final step of our estimation process is to estimate the age-varying component of the disutility from work, setting it so that the life-cycle labor supply profiles generated by the model match those found in the NLSY79.

4.1 Parameters Taken from Other Studies

Table 2 displays the values for parameters taken from other studies.

Non-college and college men enter the model one year after their modal graduation ages, 19 and 23, respectively. They retire at age $J_R = 65$ and die at age $J = 80$.

We set the utility curvature parameter, γ, to 0.738, following Imai and Keane (2004). Estimates of this parameter vary widely (see the discussion in De Nardi, French and Jones (2010)). With separable utility, however, a value of γ greater than 1 would in a static model imply that the income effects of a wage change dominate the substitution effects. Given that many of the younger individuals in our model live nearly hand-to-mouth, consistent with large income effects, using $\gamma > 1$ would imply that young men would sometimes respond to wage increases by working fewer hours. This would rule out by construction the hypothesis that the higher hours of married men are due to their higher wages. Because we want to explore this hypothesis, as an alternative to the mouths-to-feed mechanism, setting γ to a value less than 1 is appropriate. Sensitivity analyses in Section 5.2 show that the effects of marriage on hours are robust to this parameter.

Our choice of the Frisch elasticity, $\xi = 0.75$, lies in the middle of a wide range (Keane and Rogerson, 2012). In a recent paper, Bick, Blandin and Rogerson (2020), applying the approach for two-earner households developed by Bredemeier, Gravert and Juessen (2019), find elasticities ranging from 0.51 to 1.07. We set the time discount factor β to 0.95 and the gross interest rate R to 1.02, both standard values.

Table 2: Parameters Taken from Other Studies

Description	Parameter	Value	Target/Source
Demographics			
Starting age, non-college	J_{nc}	19	
Starting age, college	J_c	23	
Retirement age	J_R	65	
Terminal age	J	80	
Preferences			
Coefficient of RRA	γ	0.738	Imai and Keane (2004) (see text)
Frisch elasticity	ξ	0.75	Various (see text)
Equivalence scale	η_f	eqn. (30)	Citro and Michael (1995)
Consumption utility shifter, married	$N_{f:r=mr}$	2	See text
Consumption utility shifter not married	$N_{f:r\neq mr}$	1	See text
Intertemporal discount factor	β	0.95	
Budget			
Interest rate	R	102%	
Child care cost per young child	χ_y	28%	Borella, De Nardi and Yang (2019)
Child care cost per older child	χ_o	7%	Borella, De Nardi and Yang (2019)
Child support cost, unmarried men	δ_a	1.7%	See text
Part-time wage penalty	ζ	0.415	Aaronson and French (2004)
Borrowing limit	k_{min}	\$31,660	$0.5\bar{e}$ (see text)
Government			
Average household income	$\bar{y}$	\$75,200	CPS-ASCE
Income Tax	τ_1^f, τ_2^f		Guner, Kaygusuz and Ventura (2014)
SS tax	τ_{ss}	5.2%	2013 value
SS benefit, man, non-college	$b_{1,nc}$	\$20,570	See text
SS benefit, man, college	$b_{1,c}$	\$29,520	See text
SS benefit, spouse, non-college	$b_{2,nc}$	\$15,620	See text
SS benefit, spouse, college	$b_{2,c}$	\$21,810	See text

Note: Child care and child support costs are expressed as fractions of earnings, and are per child. Quantities are expressed in 2013 dollars.

Our formulation of the equivalence scale η_f comes from Citro and Michael (1995):

$$\eta_f = \begin{cases} 1, & \text{if } r \neq m, \\ (2 + \mathbb{1}_{a<gc} \cdot 0.7n)^{0.7}, & \text{if } r = m. \end{cases} \tag{30}$$

Grown children, who are assumed to live outside the household, do not enter the formula.

We set N_f, which scales the utility from per capita consumption, to 2 for married men and 1 for the unmarried; we are effectively assuming that married men receive utility from their wives' consumption. The literature provides little guidance for setting N_f. As we show in Section 5.3 below, the model is able to match the run-up in hours around the date of marriage only if N_f increases upon marriage.

Spouses who work surrender a fraction of their earnings to pay for formal childcare. Using Borella, De Nardi and Yang's (2019) estimate for the 1955 birth cohort, we set χ_a to 28% and 7% of her earnings, per child, for young and old children, respectively. Unmarried men do not devote any time to parenting, but pay child support costs equal to $\delta_a = 1.7\%$ of their earnings for each non-grown child. We take this number from the NLSY79.[12]

We set ζ, the parameter governing the part-time wage penalty, to 0.4, following Aaronson and French (2004). At this value, a person working half-time suffers a 25% decrease in wages.

The borrowing limit for working age men, a_{min}, is \$31,660, 50% of average household labor income, $\bar{e} = \$63,320$. The latter quantity is derived from an average household income ($\bar{y}$) of \$75,200 for 2013, as reported by the Census.[13]

We set the income tax parameters to the values reported by Guner, Kaygusuz and Ventura (2014, Table 10), who estimate tax rates as a function of income using administrative data. The Social Security tax rate τ_{ss} equals 5.2%, the value in effect in 2013. Our estimates of Social Security benefits, b_{1e} and b_{2e}, are based on microsimulation estimates from Purcell, Iams and Shoffner (2015, Table 3), adjusted for real wage growth.[14]

4.2 Parameters Estimated Outside the Behavioral Model

We estimate three sets of parameters outside the model: (i) the parameters governing the stochastic process for male wages; (ii) the parameters determining the probability that a spouse

[12]The NLSY79 data show that 28.73% of men with non-resident children pay child support, which as a fraction of earnings has a median value of 9.4%. These data also reveal that men with non-resident children have an average of 1.6 such children. Dividing the product of the first two numbers by the third gives us $(0.2873 \cdot 0.094)/1.6 = 0.017$.

[13]The quantity $\bar{y} = \$75,195$ represents net domestic product per household. Assuming that the depreciation rate d is 0.08, and the capital to GDP ratio $\frac{\bar{y}+d\cdot k}{k}$ is 3, we get GDP $= \bar{y} + d \cdot k = \$98,941$. Assuming a labor share of 0.64, labor income per household, $\bar{e}$, is \$63,320.

[14]We use Purcell, Iams and Shoffner's (2015) alternative specification, which assumes that the real wages of non-college and college graduates grow at annual rates of 0.7% and 1.6%, respectively. Because these estimates are for people born between 1965 and 1979, on average 11.5 years younger than those in the NLSY, we deflate them by 11.5 years of real wage growth. (We also convert the numbers into 2013 dollars using the CPI.)

Table 3: Parameters for Male Wages and Spousal Earnings

Description	Parameter	Value, Non-College	Value, College Graduates
Male Wages			
Autocorrelation	ρ^w	0.932	0.937
Standard deviation, innovation	σ^ε	0.150	0.142
Standard deviation, initial value	σ^{w0}	0.130	0.171
Mean-shifter, age	α_j^w	$(-0.040, 0.066, -0.069)$	$(-0.624, 0.112, -0.0114)$
Spousal Earnings			
Dependence on husband's wages	ρ^s	0.079	0.121
Standard deviation, innovation	σ^s	0.059	0.154
Effect of children on employment	$\alpha_{a,j}^{s,1}$: yc, oc	$(-0.836, -0.248)$	$(-1.000, -0.482)$
Effect of man's age on employment	$\alpha_{a,j}^{s,1}$	$(0.698, 0.0658, -0.179)$	$(1.256, 0.0499, -0.164)$
Effect of man's age on earnings	$\alpha_j^{s,2}$	$1.351, 0.050, -0.0811)$	$(1.500, 0.0838, -0.171)$
Effect of spousal shock on earnings	β^s	10.0	4.26

Note: Superscripts are used to distinguish parameters, while subscripts dependencies. We have omitted education (e) subscripts, as every parameter varies by education level. All parameters with the age subscript j utilize a quadratic in age. See Sections 4.2.1-4.2.2 and Appendix B for details.

works and her wages when working; (iii) the parameters determining the stochastic process for family structure.

4.2.1 The Male Wage Process

Using equation (3), we compute the hourly wage term w_j for an individual with annual earnings me_j and annual hours worked h_j as

$$w_j = me_j / h_j^{1+\zeta}. \tag{31}$$

We estimate the wage process for men from equations (4)-(5) in two stages, following French (2005). First, we run an individual fixed effects regression of log wages on a quadratic in age and a control for the national unemployment rate during January of that calendar year. The estimated coefficients for the quadratic in age, along with the average fixed effect, provide us with values for $\alpha_{e,j}^w$. In the second stage, we calculate a residual wage for each individual, which is the difference between the log of his actual wage and the predicted wage $\alpha_{e,j}^w$ (plus the estimated unemployment effect). We then generate the covariance matrix for the first four lags of this residual, which we use to estimate the autocorrelation term ρ_e^w and the variance of the innovation term σ_e^ε. The details of this procedure are described in Appendix B, and the estimates are shown in the first panel of Table 3.

4.2.2 Spousal Earnings

The spousal earnings process in equations (10)-(13) requires estimates of: the dependence of the spouse's permanent earnings shock, $\tilde{s}$, on the husband's wage (ρ_e^s), along with the standard deviation of this shock's innovation (σ_e^s); the parameters of the mean-shifter for the probability that a spouse works ($\alpha_{a,e,j}^{s,1}$); the parameters of the mean-shifter for the earnings of working spouses ($\alpha_j^{s,2}$); and the relative importance of the permanent shock for spousal earnings (β_e^s). We assume that both mean-shifters contain a quadratic polynomial in the husband's age, and that the mean-shifter for spousal employment contains coefficients for the presence of young or old children (the base case is no children or grown children). We also set the floor for earnings to $\underline{s} = \$3,630$ and censor all spousal earnings in the data below this level.[15]

The bottom panel of Table 3 presents our parameter estimates. We estimate these parameters using the simulated method of moments, targeting age profiles for the share of spouses who work, the mean of log earnings among working spouses, the correlation of spousal earnings and male wages, and the standard deviation of log earnings among working spouses. We construct separate age-employment profiles for wives with young and older children (determined by the age of the oldest child). Appendix C shows the model's fit of spousal employment and earnings. Consistent with the data, the model predicts that the employment rate for women with young children is about 20 percentage points less than the rate for women with no children. The employment rate for women with older children lies between these cases, but is closer to the childless rate. In contrast, among spouses that work earnings are close to invariant, at least on average, over the number of children.

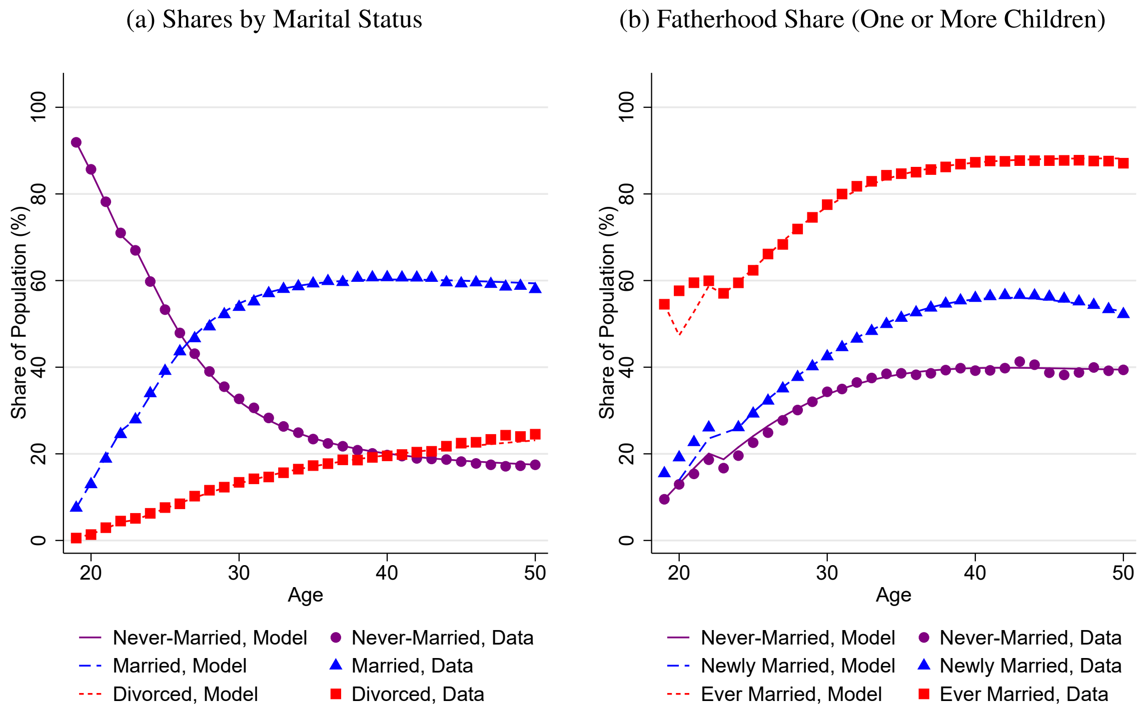
Appendix C shows that spousal earnings are quite volatile, leading to large estimated values of the scaling parameter β^s. In contrast, our estimated values of ρ^s, which links the spousal earnings shock $\tilde{s}$ to male wages, are relatively small, so that much of the variation in spousal earnings is specific to the spouse. As a result, in our model the correlation between male wages and spousal earnings (among workers) never exceeds 0.3 and is often much lower. This is consistent with the observed correlations that we target. Our spousal earnings process thus generates limited assortative matching, at least along the intensive margin.

4.2.3 Family Structure Dynamics

The probabilities governing the dynamics of relationships and children in equations (6)-(8) are modelled as a set of logistic probabilities. We estimate these probabilities to match family demographics over the life cycle in the NSLY79, along with a moment capturing the effect of wages on the probability of marriage. We include the latter moment because in the model, the probability of "moving ahead" in a relationship depends in part on wages: the transition

[15]This is the annual earnings from working 10 hours per week for 50 weeks at \$7.26/hour, which is the median federal minimum wage over this time period.

Figure 5: Marital and Child Status by Age: Model and Data



Source: Sample is men age 19 - 50. Ages 19 - 22 include only men with less than a four year college degree; ages 23 - 50 include all education groups. Never-married men are those who at the age in question have yet to marry; newly-married men are those in their first year of marriage. Data correspond to the NLSY79. Model results are author calculations; see Section 4.2.3 and Appendix D for details.

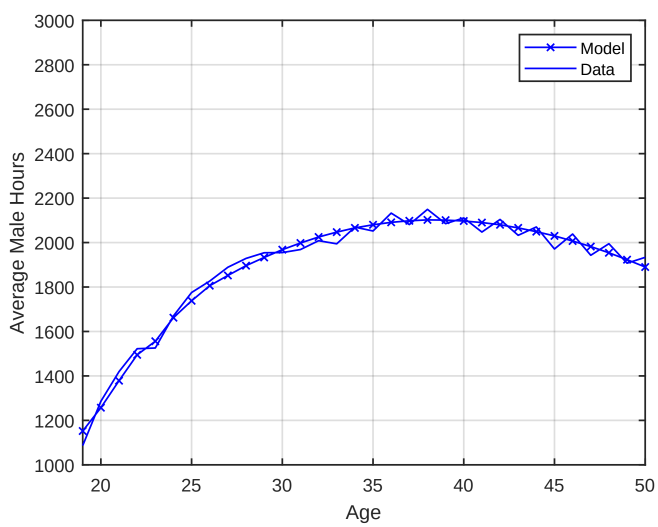
probabilities $\phi^{rl}_{e,j}(\tilde{w}_j)$, $\phi^{en}_{e}(\tilde{w}_j)$ and $\phi^{mr}_{e}(\tilde{w}_j)$ all vary with the idiosyncratic wage shock $\tilde{w}_j$. Estimating these effects from the data requires variation in wages that is exogenous to other determinants of marriage. Although such variation is hard to find in the NLSY79, in the CPS we can instrument for an individual's wage with the average wage in his state of residence. Appendix D.2 presents detailed results. The estimated coefficient in the CPS regression is 0.014, which implies that a 10% increase in wages increases the probability of getting married by 0.14 percentage points. For context, the baseline probability of marriage in the estimation is 2.5%, implying that a 10% increase in wages increases the probability of getting married by 5.6%. We assume that in our logistic transition probabilities, the coefficient on wages, θ, is the same at all stages of a relationship, and set θ so that the wage coefficient on a simulated version of the CPS regression matches the observed coefficient. Appendix D describes our specification and estimation procedure in more detail, and Appendix Table 6 provides the parameter estimates.

Figure 5a compares the life-cycle relationship profiles generated by the model to those observed in the data; the fits are quite close. Figure 5b compares the observed and predicted rates of fatherhood (at least one child) by marital status.[16] Especially notable is the model's fit of the incidence of fatherhood among the newly-married (men in their first year of marriage), which shows the model does a good job of capturing the effects of pre-marital children on relationship transitions. Appendix D presents additional, more disaggregated, comparisons.

4.3 Parameters Set within the Behavioral Model

We allow the disutility of work to depend on education and age through the parameter $\psi_{e,j}$. We set $\psi_{e,j}$ so that the life-cycle profiles of hours for each education group generated by the model match those found in the data. To limit the number of parameters estimated, we assume that for each group $\psi_{e,j}$ is a quadratic function of age. Appendix E shows that our estimates imply that the disutility from work is lowest in the middle of a man's career and highest at its beginning and end. Figure 6 compares the life-cycle profile of average hours implied by the model to the the averages contained in the NLSY79. Our model fits the targeted data well, even though it is tightly parameterized: we have 32 targets for non-college men and 28 for college men but only 3 free parameters for each group.

Figure 6: Average Hours by Age, Model and Data



Source: Data results use the NLSY79. Model results are authors' calculations. See text for details.

[16]The profiles shift downward at age 23 because that is the age at which college-educated men enter our sample.

5 Results

To find the model's predictions for labor supply around the time of marriage, we replicate the fixed effect regressions analyzed in Section 2. After solving the model numerically, we simulate 100,000 complete life histories, generating a panel comparable to the NLSY79. We then normalize each man's hours, wages and earnings by their age- and education-conditional averages, and perform the fixed effect regression described in equation (1).[17]

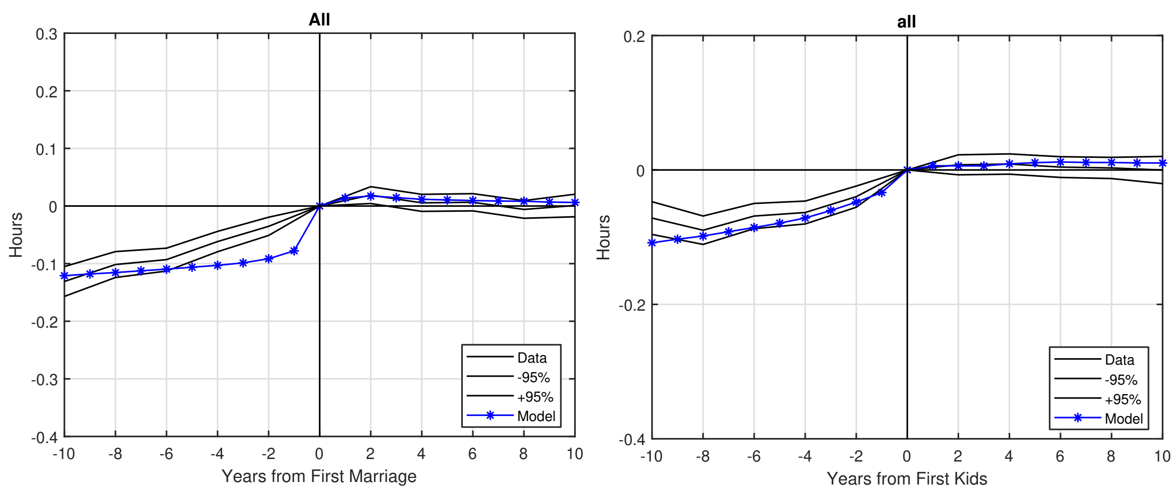
5.1 Benchmark Model

We begin by assessing the model's ability to generate the observed increase in hours around the time of marriage. Figure 7a shows that the model replicates almost exactly the total increase in hours from ten years before marriage to 10 years after. The model also accurately predicts that hours change very little once marriage occurs, although it overstates the extent to which hours increase immediately before marriage, as opposed to earlier in the relationship.

Figure 7: Hours of Work by Distance from Marriage or First Child: Model and Data

(a) Distance from date of marriage

(b) Distance from date of first child



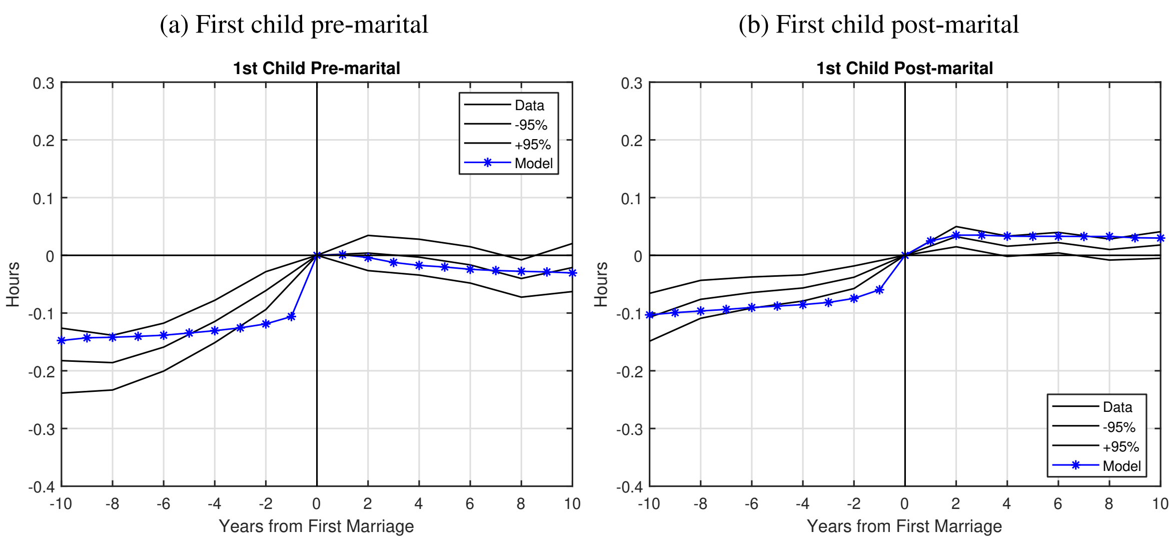
Source: Data results are from regressions using NLSY79 data, see Section 2.2 for details. Model results are authors' calculations, see text for details.

It is natural to ask whether the effect of marriage on hours is primarily a response to the birth (or expected birth) of children. Figure 7b shows that hours do in fact rise steadily as the date of the first child approaches, and that the model generates a similar progression. Another way to assess the role of children is to compare men whose first child arrives on or before the year of marriage, and is thus "pre-marital", with men whose first child arrives after the year of

[17] The regressions on the simulated data exclude year effects, as they have no counterpart in the model.

marriage, and is thus "post-marital". Figure 8 shows that in both the data and the model, the run-up in hours prior to marriage is larger for men with pre-marital children, and the increase in hours after marriage is larger for men whose children are all post-marital. Figures 7 and 8 thus suggest that both marriage and children are positively associated with male labor supply, and that our model replicates much of this relationship. Moreover, because pre-marital children are more likely to be unplanned and thus uncorrelated with labor market shocks, Figure 8 provides evidence that marriage and children have causal effects on hours, and are not merely correlated through selection.

Figure 8: Hours of Work by Distance from Marriage and Timing of First Child: Model and Data



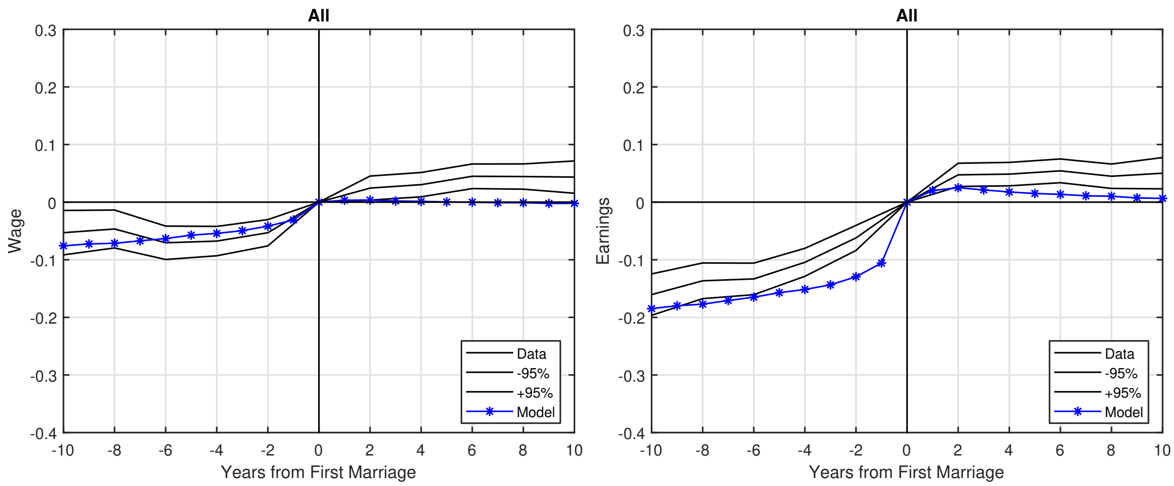
Source: Data results are from regressions using NLSY79 data, see Section 2.2 for details. Model results are authors' calculations, see text for details. Pre-marital children are those born in the year of marriage or before. Post-marital children are those born after the year of marriage.

Figure 9a shows the model's implications for wages. The model does a good job of matching the wage growth observed prior to marriage. In the model, wages rise in the run-up to marriage because higher wages increase the probability of marriage and because the increase in hours prior to marriage generates an increase in wages through the part-time wage penalty (overtime premium). A shortcoming of the model is that it does not generate wage increases after the time of marriage. This likely reflects the absence of human capital dynamics, such as learning-by-doing, that allow higher hours in one year to raise wages in subsequent years.

Figure 9b presents the earnings trajectory. Since logged earnings are the sum of logged hours and wages, the dynamics of its mean follow immediately from the mean dynamics of these two variables. In particular, the rise in earnings after marriage predicted by the model is smaller than that in the data because the model matches the observed post-marital increase in hours but undershoots the observed post-marital increase in wages. Nonetheless, the mo-

Figure 9: Wages and Earnings by Distance to Marriage: Model and Data

(a) Wages (b) Earnings



Source: Data results are from regressions using NLSY79 data, see Section 2.2 for details. Model results are authors' calculations, see text for details.

del's predictions for earnings line up with the data fairly well; in particular, the majority of the increase in earnings around the time of marriage occurs *before* marriage.

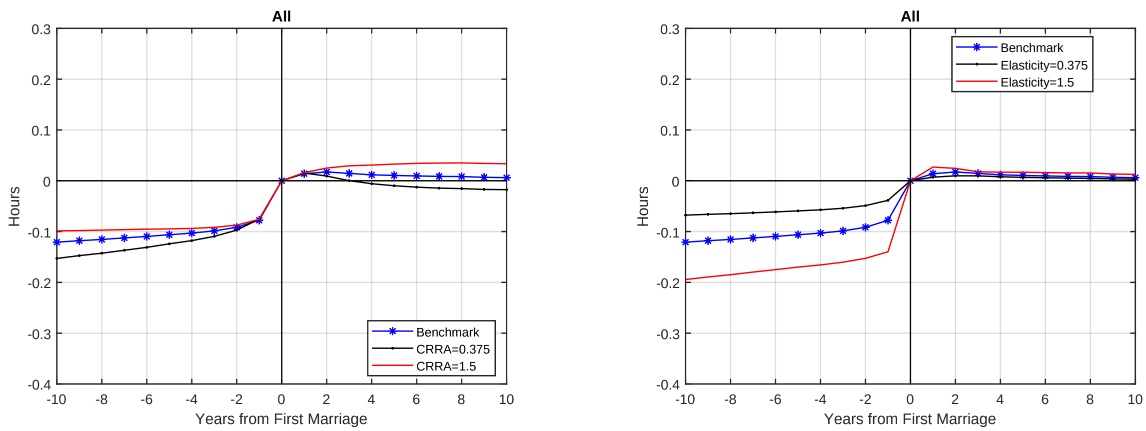
5.2 Sensitivity Analyses

We next assess the sensitivity of our results to two key parameters, namely the coefficient of relative risk aversion (γ) and the Frisch elastiticity of labor supply (ξ), halving or doubling the parameters from their benchmark values. Figure 10 shows that over this range our qualitative results do not depend on specific parameter values.

Turning to detailed effects, Figure 10a shows that as γ increases from 0.375 to 1.5, the run-up in hours prior to marriage shrinks, while the change in hours after marriage switches from a modest fall to a modest rise. To interpret these results, it proves helpful to rewrite the marginal utility of consumption as $N_f \eta_f^{\gamma-1} c^{-\gamma}$. Under our calibration, when a unmarried man marries, N_f increases from 1 to 2, while η_f increases from 1 to roughly 1.6. At any $\gamma > 0$, $N_f \eta_f^{\gamma-1}$ will increase, raising the marginal utility of consumption and encouraging work. Larger values of γ reduce the size of this response, as they make the marginal utility of consumption more sensitive to consumption itself, reducing the wealth effect. If the couple then has children, η_f grows even larger, but N_f remains at 2. Noting that most children occur after marriage, it follows that after marriage the product $N_f \eta_f^{\gamma-1}$ falls when γ is less than one and rises when it is greater than one. This is indeed consistent with Figure 10a, which shows hours falling after marriage when $\gamma = 0.375$ or 0.738 (the benchmark value), but rising when $\gamma = 1.5$.

Figure 10: Hours of Work by Distance from Marriage: Effects of Preference Parameters

(a) Coefficient of Relative Risk Aversion | (b) Frisch Elasticity



Source: Model results are authors' calculations. See text for details.

The effects of changing ξ, shown in Figure 10a, are easier to interpret. As the Frisch elasticity increases from 0.375 to 1.5, the hours responses grow in size, but their signs remain the same.

These sensitivity analyses reinforce our belief that the model provides a sensible framework for analyzing male labor market dynamics around the time of marriage. In the next section we use a series of numerical experiments to assess the model's underlying mechanisms.

5.3 Assessing the Wealth Effects of Marriage

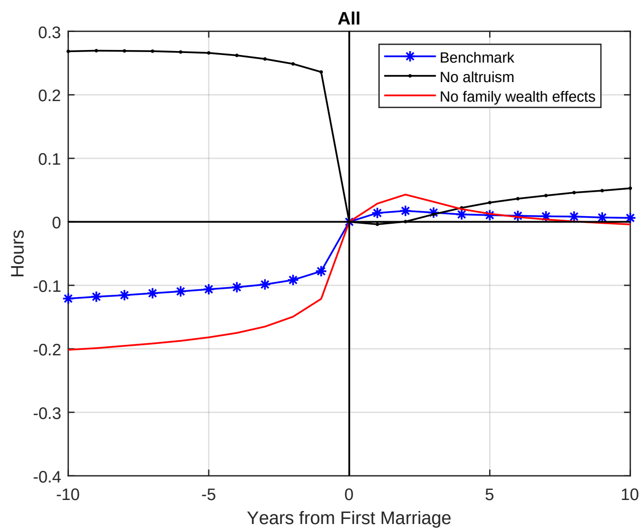
Although the mouths-to-feed effect is essentially a wealth effect, it has multiple dimensions. Applying an equivalence scale means that the husband consumes only a portion of total household consumption expenditures. Wives bring earnings into the household, while children impose child care costs. Finally, the utility shifter N_f introduces the possibility that the husband receives utility from the consumption of other family members.

To see which of these mechanisms is most importantly quantitatively, Figure 11 presents the hours trajectories generated by two alternative specifications. In the first alternative, denoted by the dotted black line, we set $N_f = 1, \forall f$. Under this specification, marriage leads hours of work to *fall*. Recall that the flow utility from consumption equals $N_f \frac{1}{1-\gamma}(c/\eta_f)^{1-\gamma}$. If η_f is increasing in family size while N_f is not, marriage and children effectively tax the man's earnings, and with $\gamma < 1$ hours will fall.

In the second alternative specification, we assume that wives have no earnings of their own, $se_j = 0$, so that children impose no direct childcare costs: the term $se(1 - n\chi_a)$ in budget equation (24) goes to zero. In the resulting trajectory, denoted by the plain red line, hours rise more than under the benchmark (starred blue line). Because the cost of each child is at most

$\chi_y = 28\%$ of their mother's earnings, and the largest possible number of children is $n = 3$, in the benchmark model $se(1 - n\chi_a)$ is always positive and removing it increases the wealth loss from marriage.

Figure 11: Hours of Work by Distance to Marriage: Benchmark and Alternative Specifications



Source: Model results are authors' calculations. "No altruism" shows hours path for specifciation where $N_f = 1, \forall f$. "No family wealth effects" shows hours path for specification where spouses and children have no direct budgetary effects ($se(1 - n\chi_a) = 0$). . See text for details.

The alternative specifications thus suggest that altruism towards spouses and children (or an observational equivalent), rather than cost, leads men to increase their labor supply around the time of their marriages. The logic behind our finding is straightforward. The assumption that additional household members impose an earnings tax is an inherent feature of equivalence scales.[18] As long as spouses cover the cost of child care, out of their earnings or through home production, married men enjoy higher household incomes, which should discourage work. This leaves the size-dependent shifter N_f as the only feasible mechanism to generate a marriage-related increase in hours. Our study is not the first to employ this feature (e.g., Fan, Seshadri and Taber (2019)),[19] but our results provide novel evidence in its support.

5.4 Assessing the Effects of Marital Selection

In our model, men with higher wages move up the relationship ladder more quickly, with the effect set to match the relationship between wages and marriage found in our IV regressions on CPS data. To assess the strength of this mechanism, in Figure 12 we present a specification

[18] The theory behind equivalence scales and their construction is discussed in Cowell and Mercader-Prats (1999) and Lewbel and Pendakur (2008).

[19] Analogues to N_f have also appeared in models of female labor supply such as Blundell et al. (2016).

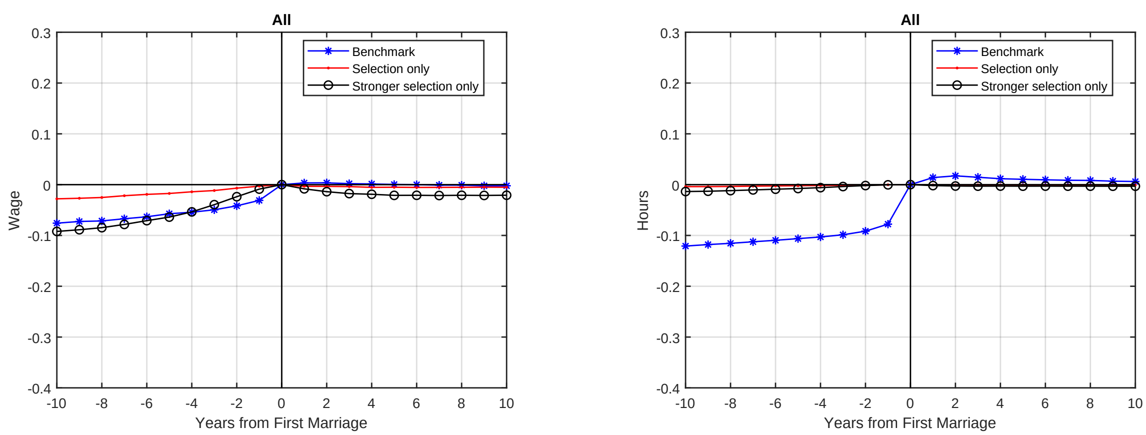
where wives and children have no effect on preferences or resources: $\eta_f = N_f = 1, \forall f$, and $se_j = \chi_a = \delta_a = 0$.

Figure 12a shows that the wage run-up generated by the selection-only specification (the plain red line) is much smaller than the one found in the baseline model (the starred blue line). In the model, wages are driven more by the part-time wage penalty, where higher hours lead to higher wages, than by selection. To account for the possibility that our estimates understate the degree of wage selection in effect, we introduce a "stronger" selection-only alternative, where we multiply the wage selection effect, namely the coefficient θ, by 4. At this value of θ, a 10% increase in wages raises the probability of getting married by roughly 20%. The stronger selection-only specification generates a pre-marital wage trajectory (the black circled line) very similar to that of the baseline model. Even with stronger selection, however, wages fall modestly after the year of marriage, as the transitory wage shocks that promoted marriage wear off. In the baseline model, wages continue to grow after the year of marriage, albeit modestly, because hours remain elevated, raising wages through the part-time wage penalty.

Figure 12: Labor Market Dynamics around Marriage: Benchmark and Selection-Only Models

(a) Hourly Wages

(b) Annual Hours Worked



Source: Model results are authors' calculations. In the selection-only models, wives and children have no effect on husbands' consumption or the utility they receive from it. In the stronger selection-only model, the effect of wages on relationship transition probabilities is $4\times$ its baseline value. See text for details.

The differences in hours, shown in Figure 12b, are even more striking. In the stronger selection-only model, hours rise less than 2% prior to marriage, far below the increase seen in either the benchmark model or the data; in the unadjusted selection-only model, hours barely change at all. To interpret this finding, note that in the data and baseline model the run-up in hours prior to marriage is larger than the run-up in wages. If the increase in hours is solely a response to wage increases, the underlying labor supply elasticity must be well in excess of 1. Recall that we set the Frisch elasticity ξ to 0.75, a fairly standard value. If income effects are large, as is often the case for young men with little wealth, the uncompensated elasticity will be significantly smaller, consistent with our findings. The data also show (see Figure 3) that hours are more or less constant after marriage, even as wages continue to rise. This too suggests that the elasticity of hours with respect to wages cannot be very large.

The results shown in Figure 12 imply that wage selection plays a secondary role in generating the hours dynamics observed around the time of marriage. The degree of wage selection that we estimate is modest, and even if it were significantly larger, matching the observed hours dynamics would require very large uncompensated wage elasticities. The hours increase associated with pre-marital chidren, who are more likely to be unplanned, also suggests that wage selection cannot be the sole explanation. (See the discussion of Figure 8.) Selection might also occur along other dimensions, however, such as unobserved heterogeneity in wage *growth* (Guvenen, 2009). Once again, the behavior of men with pre-marital children suggests that selection is not the entire story.

5.5 Taking Stock

The results presented immediately above lead us to three conclusions. First, the model generates a reasonable fit of male hours dynamics around the time of marriage. Second, reverse causality, i.e., selection into marriage on the basis of transitory wage or hours shocks, cannot by itself explain the patterns observed in the data. The mouths-to-feed mechanism appears to be an essential driver of male labor supply. Finally, the key component of the mouths-to-feed mechanism is that married men receive utility from the consumption of their wives and children (or behave in an observationally equivalent way).

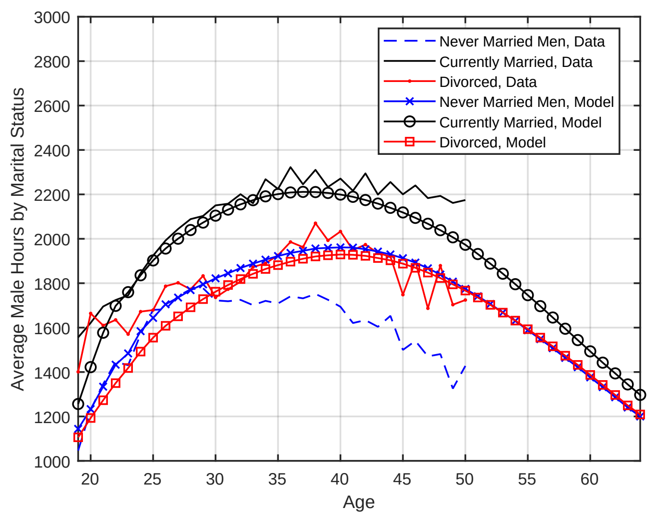
6 Cross-sectional Comparisons and No-marriage Counterfactuals

6.1 Cross-sectional Comparisons

Our model implies that through the mouths-to-feed mechanism marriage has an important causal effect on hours. The data analysis in Section 2 suggests that selection effects are also present, however, and in our model men with higher wages are more likely to marry. To consider both mechanisms together, we employ a series of cross-sectional comparisons.

Figure 13 shows average hours of work at each age, from both the NLSY79 and the model, for three marital status categories. The black lines show hours profiles for men who are currently married; the blue lines show hours for men who at the age in question have yet to marry, the “never married”; and the red lines show hours for men who were are not currently married but were married in the past, the “divorced” (which in the data include a handful of widowers). The model does a fairly good job of matching the work hours of the currently married, and for the most part matches the work hours of the divorced, although it undershoots their hours at younger ages. In contrast, after age 30 the model overpredicts hours of work by the never married, with the gap expanding to around 400 hours by age 50. This suggests that there are mechanisms present in the data but not the model that make married men more willing to work regardless of their marital status. One possibility would be preference heterogeneity, where men who have a higher willingness to work also have a higher willingness to marry or better prospects in marriage markets. The absence of such fixed effects in our model should have little bearing on how well it matches the run-up in hours at the time of marriage, as our distance-from-marriage trajectories are found using fixed effect regressions.

Figure 13: Hours of Work by Age and Marital Status: Data and Model



Source: Model results are authors' calculations. See text for details.

Another way to measure selection effects can be found in the regression results presented in Table 1. The first two columns of this table, which report OLS estimates, show that married men work 295-340 hours more than the never-married, while the third column shows that the difference falls to 100 hours once fixed effects are included. This suggests that selection accounts for about 200 hours of the unconditional difference. When we perform the same regressions on model-generated data, the coefficient on the marriage indicator is 212 hours for the OLS regression and 191 hours for fixed effects.[20] As with the life-cycle profiles just discussed, in the regression analyses the model displays smaller selection effects. The more surprising result is that the fixed effect coefficient in the model is significantly larger than its data counterpart, even though the model largely replicates the marriage-related run-up in hours, which are also estimated using fixed effects regression. The discrepancy may arise because the run-up in hours generated by the model occurs closer to the time of marriage than in the data; as Figure 7a shows, the area between the hours line and the horizontal axis is bigger in the model. This

[20]The model-generated OLS regression, which has no controls for education or race, is most comparable to the first, simpler OLS regression in Table 1.

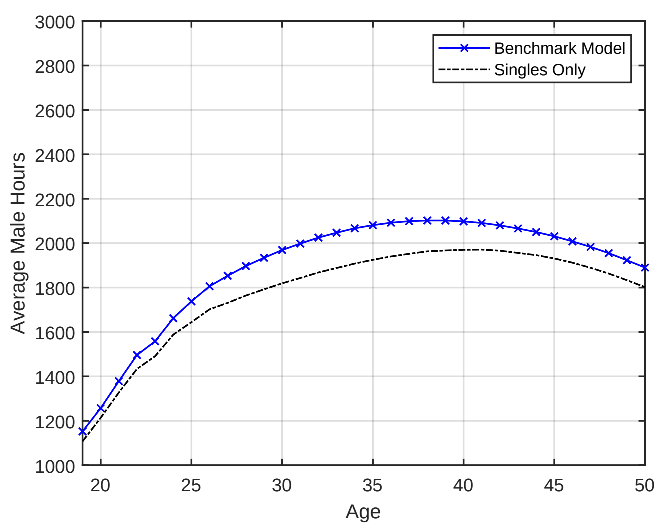
means that after controlling for fixed effects, never-married men on average work fewer hours prior to marriage in the model than in the data, leading to a larger coefficient on the marriage indicator.

6.2 Counterfactual Experiments

The aggregate importance of the mouths-to-feed effect depends not only on its size but on the frequency of marriage. This motivates our next experiment, where we set the probability of marriage to zero, convert men who were entering the simulations married into singles, and repeat our simulations. Figure 14 compares the hours profile from this experiment to that of baseline specification. The aggregate effects of eliminating marriage are largest between ages 30 and 35, when work decreases by about 200 hours per year. Taking averages across all years, we find a decline of 114 hours, or 6%.

By way of comparison, in Siassi's (2019) framework, the feature most akin to our mouths-to-feed mechanism is a stronger bequest motive for individuals with children.[21] Removing this feature causes his estimate of the proportional earnings (not hours) gap to shrink by about 3 percentage points (Siassi, 2019, Table 5), half the size of the 6 percentage point effect found by us.

Figure 14: Hours of Work with and without Marriage



Source: Model results are authors' calculations. In the "Singles Only" specification, initial singles never marry and men who would otherwise enter the simulations as married are converted to singles. See text for details.

[21] Because Siassi (2019) employs the GHH flow utility function (Greenwood, Hercowitz and Huffman, 1988), which has no wealth effects, his framework contains no direct counterpart to our mouths-to-feed mechanism.

7 Conclusion

Male work hours increase 15% in the run-up to marriage. In this paper we use a life-cycle model to assess two potential explanations: (i) transitory selection, where men with positive wage shocks are more likely to marry; and (ii) the mouths-to-feed effect, where marriage raises the marginal utility of consumption.

A reasonably-calibrated version of the model, utilizing stochastic processes estimated from the NLSY79, is able to replicate the marriage-related hours dynamics observed in the same dataset. The model further shows that a significant mouths-to-feed effect is necessary to match the data. Notably, the run-up in wages prior to marriage is smaller than the run-up in hours, and at conventional labor supply elasticities is far too small to generate the observed hours increase. The increases in hours that follow pre-marital births, which are arguably exogenous to wages or employment shocks, also support the mouths-to-feed story.

Counterfactual experiments with the model show that if marriage were eliminated, male hours of work would on average fall 6%. Although the extended decline in marriage and employment among blue-collar men undoubtedly contains causal effects working in both directions, our model suggests that exogenous declines in marriage rates, should they be occuring, could generate significant reductions in hours. Extending our model to study the continuing changes in labor and marriage markets is a priority for future work.

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For Online Publication: Appendices

A Supplemental Estimates of the Relationship between Marriage and Male Labor Market Outcomes

A.1 Supplemental Estimates: State Average Hours Worked

Table 4: Predictors of State Average Male Annual Hours Worked in the CPS

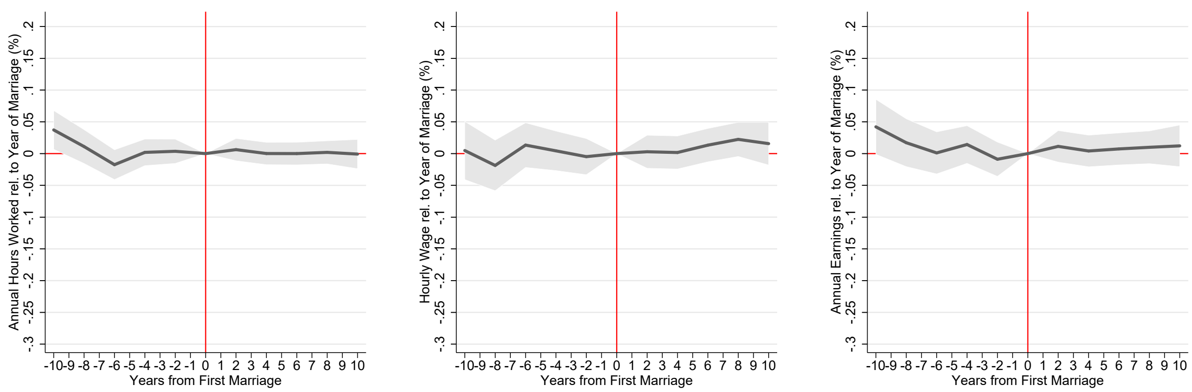
	(1)	(2)	(3)
Constant	1450.0***	1443.3***	1537.9***
	(36.6)	(56.0)	(74.5)
Share Married	706.2***	768.7***	609.3***
	(62.1)	(84.3)	(123.1)
Average Age	–	0.4	0.0
		(0.5)	(0.3)
Share Less than High School	–	0.3	−5.4
		(14.1)	(8.1)
Some College Share	–	11.1	4.6
		(11.7)	(6.8)
Bahelor's + Share	–	6.0	3.7
		(11.7)	(6.8)
Share Black	–	−23.1	4.2
		(15.1)	(9.1)
Year FEs		*Y*	*Y*
State FEs			*Y*
R^2-adj	0.22	0.42	0.83
N	459	459	459

Source: Men age 19 - 54 in the 1975-2019 waves of the CPS ASEC. The sample includes individuals with zero annual hours. The unit of observation is a 5-year average of average hours for a given state. There are nine 5-year time periods in our sample period: 1975-1979, 1980-1984, ..., 2015-2019; the data include all 50 states and the District of Columbia; together this implies 459 observations.

A.2 Supplemental Estimates: Placebo Test for Distance-from-Marriage Regressions

Figure 15: Placebo Test: Labor Market Dynamics in the Years around Marriage

(a) Annual Hours Worked (b) Hourly Wages (c) Annual Earnings

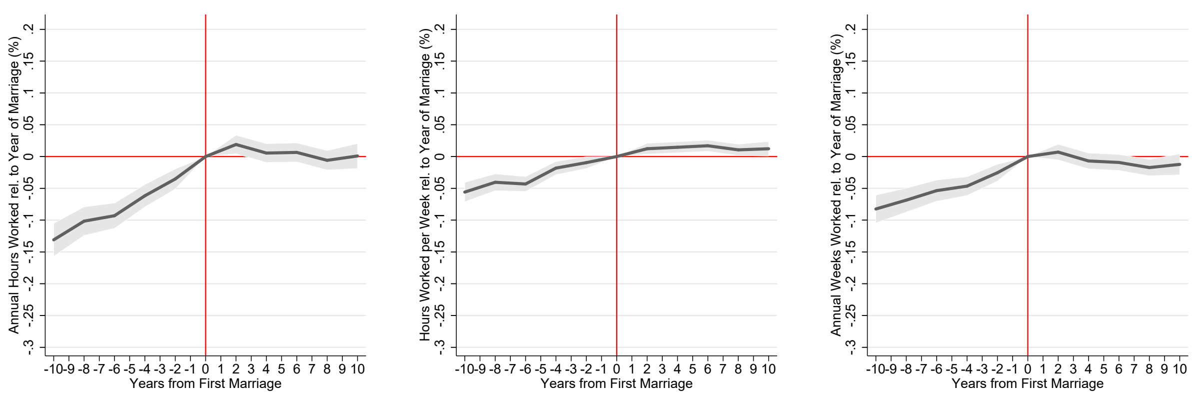


Source: Males age 19 - 54 in the NLSY79, see text for details. The solid line plots distance-from-marriage coefficients from the individual fixed effects regression equation (1). The shaded region corresponds to 95% confidence intervals. The results in this table correspond to a placebo test of the results in Figure 3, in which age of first marriage was randomly reassigned among individuals in the regression sample.

A.3 Supplemental Estimates: Decomposing the Distance-from-Marriage Effects on Hours

Figure 16: Dynamics of Weekly Hours and Annual Weeks Worked in the Years around Marriage

(a) Annual Hours Worked (b) Hours per Workweek (c) Annual Weeks Worked



Source: Males age 19 - 54 in the NLSY79, see text for details. The solid line plots distance-from-marriage coefficients from the individual fixed effects regression equation (1). The shaded region corresponds to 95% confidence intervals.

B Estimating the Male Wage Process

Our approach closely follows French (2005). We begin by running an individual fixed effects regression on log wages. The coefficients from this regression, along with the average fixed effect, give us predicted wages, $\alpha^w_{e,j}$. Subtracting $\alpha^w_{e,j}$ (along with an adjustment for aggregate unemployment) from observed wages produces a panel of wage residuals, $\{\widehat{w}_{i,j}\}_{i,j}$. Next, we assume that the stochastic process for the wage residuals is

$$\widehat{w}_{i,j} = \tilde{w}_{i,j} + \bar{w}_{i,j}, \tag{32}$$

$$\tilde{w}_{i,j} = \rho^w_e \tilde{w}_{i,j-1} + \varepsilon^w_{i,j}, \tag{33}$$

$$\varepsilon^w_{i,j} \overset{iid}{\sim} N(0, \sigma^{\varepsilon}_e), \tag{34}$$

$$\bar{w}_{i,j} \overset{iid}{\sim} N(0, \sigma^{\bar{w}}_e), \tag{35}$$

$$\bar{w}_{i,j} \perp\!\!\!\perp \tilde{w}_{i,j+s}, \ \forall t, s. \tag{36}$$

We can then back out ρ^w_e from the autocorrelations of $\widehat{w}_{i,j}$:

$$\rho^w_e = \frac{cov_e(\widehat{w}_{i,j}, \widehat{w}_{i,j+3})}{cov_e(\widehat{w}_{i,j}, \widehat{w}_{i,j+2})}. \tag{37}$$

With ρ^w_e in hand, the standard deviation of the innovation $\varepsilon^w_{i,j}$ follows from

$$\sigma^w_e = \sqrt{\frac{cov_e(\widehat{w}_{i,j}, \widehat{w}_{i,j+2})(1 - (\rho^w_e)^2)}{(\rho^w_e)^2}}\,. \tag{38}$$

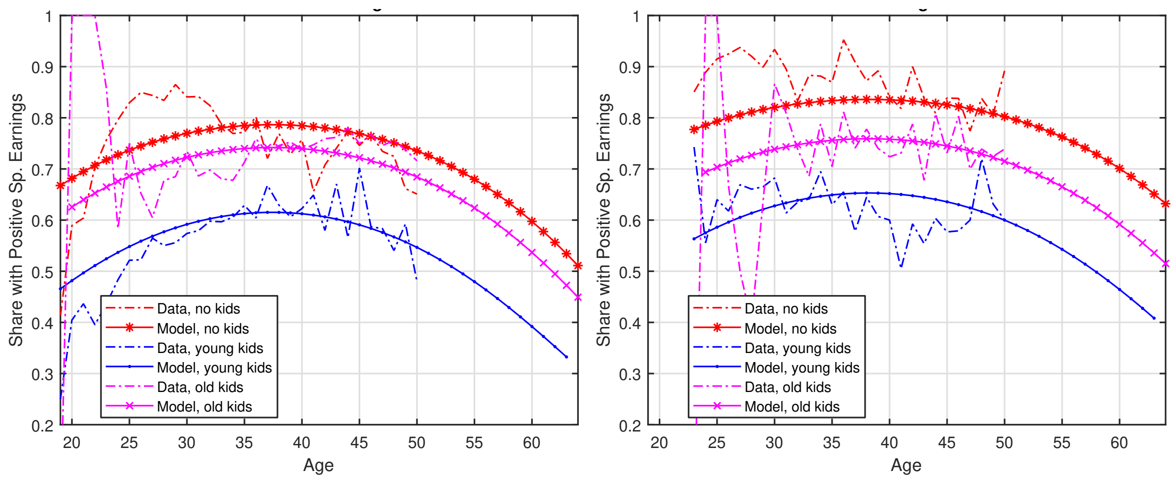
C Model Fit of Spousal Employment and Earnings

Figure 17 compares the model's predictions of spousal employment to those found in the NLSY79. The model replicates the lower rates of employment among women with children, especially young children. Figure 18 provides the corresponding comparison for the logged earnings of employed spouses. In contrast to employment, spousal earnings vary relatively little by family composition – in the model the only differences are (miniscule) selection effects.

The first row of Table 5 shows the standard deviation of these earnings, again conditional on working. This statistic helps pin down β^s_e, the coefficient on the shock $\tilde{s}$ in the spousal earnings equation, and σ^s_e, the volatility of this shock. While we target standard deviations on a age-by-age basis, the data moments are noisy, and we therefore report just the unconditional average across ages. Spousal earnings are quite volatile: the standard deviation of logged earnings ranges between 0.64 and 0.68.

Figure 17: Spousal Employment by Age, Education and Age of Children, Model and Data

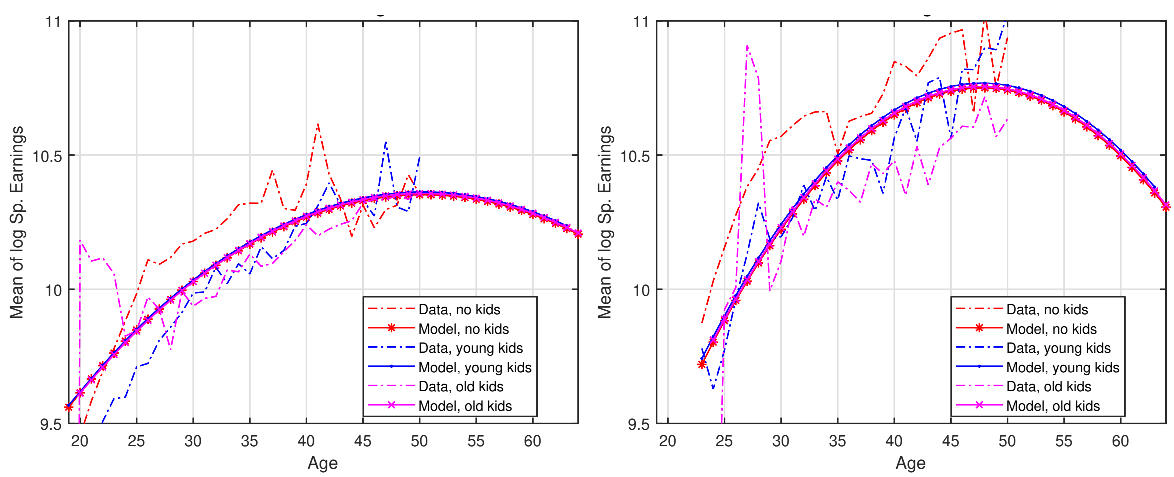
(a) Less than College (b) College



Source: Data are for males age 19-50 (less than college) or 23-50 (college graduates) in the NLSY79, see text for details. Model results are authors' calculations, see text for details.

Figure 18: Spousal Earnings (if Employed) by Age, Education and Age of Children, Model and Data

(a) Less than College (b) College



Source: Data are for males age 19-50 (less than college) or 23-50 (college graduates) in the NLSY79, see text for details. Model results are authors' calculations, see text for details.

Our final target is the correlation between male wages and spousal earnings, conditional on both parties working, which, along with the earnings' variance, helps identify ρ_e^s and σ_e^s, the coefficient on male wages and the idiosyncratic variation, respectively, in the distribution of the shock $\tilde{s}$. Table 5 shows that among couples with no children, the correlations are less than 0.18 for those with a college degree and less than 0.28 for those without. The correlation coefficients for couples with children are even lower.

Table 5: Standard Deviation of Spousal Earnings and Correlation with Male Wages, Model and Data

	Less than College		College Graduates	
Statistic	Data	Model	Data	Model
Standard deviation, $\ln(se_j)$	0.6401	0.6473	0.6688	0.6770
Correlation $(\ln(se_j), \tilde{w}_j)$				
No children	0.2784	0.2448	0.1721	0.1463
Young children	0.1622	0.1588	0.0900	0.0892
Older children	0.1207	0.1371	0.0078	0.0725

Note: Data are for males age 19-50 (less than college) or 23-50 (college graduates) in the NLSY79 and are restricted to observations with positive values, see text for details. Model results are authors' calculations, see text for details. Standard deviations and correlations are calculated age-by-age; reported above are unconditional averages.

D Estimating the Dynamics of Family Structure

D.1 Main Estimates

Fertility dynamics are governed by $\phi^n_{n,r,j}$, the probability of a new child being born given existing children n, relationship status r, and man's age j. New children stop arriving once the existing children age. Let $\phi^a_{yc,j}$ denote the probability that all the young children of an age-j man become old children; and $\phi^a_{oc,j}$ the probability that all the old children become grown. All of these probabilities are modeled as logistic functions of a quadratic polynomail in the man's age.

The parameters governing relationship dynamics are $\phi^{rl}_j(\tilde{w})$, the probability of a single man of age j entering a relationship; $\phi^{en}(\tilde{w})$, the probability of a man in a relationship becoming engaged; $\phi^{mr}(\tilde{w})$, the probability of an engaged man becoming married; ϕ^{owb}, the effect of an out-of-wedlock birth on the probability of a relationship advancing; and $\phi^d_{n,j}$, the probability of a married man of age j with n children becoming divorced. The probabilities on entering a relationship and getting divorced depend on the man's age via a quadratic function. The probabilities of becoming engaged or becoming married are age-invariant; because we do not observe the relationship status of unmarried men, we simplify the model by assuming that all the age-related variation prior to marriage is captured in the rate at which new relationships form. Because the divorce probability is notably higher for men with three or more children in the data, we estimate two sets of divorce probabilities, one for men with less than three children, and a second for men with three children.

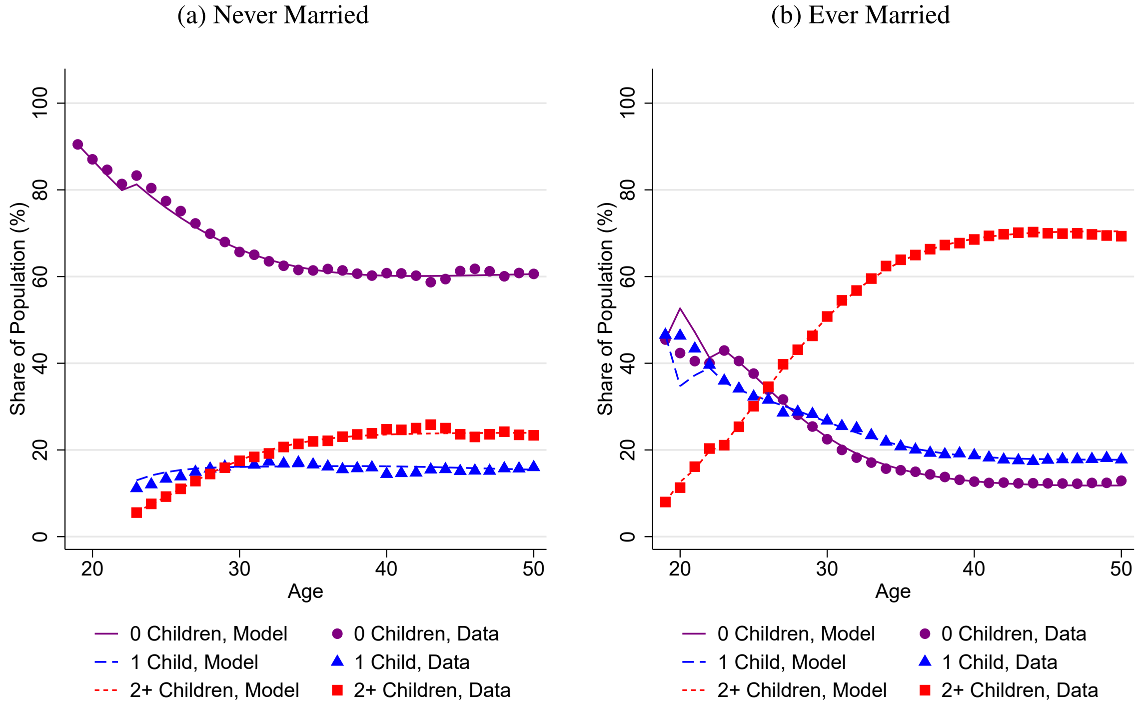
We estimate these parameters separately for each education group, using the simulated method of moments. Specifically, we target the following empirical age profiles: the share of men who are never married and who have n children, for $n \in \{0,1,2,3+\}$; the share of men who have ever been married and who have n children, the share of divorced men who have n children, and the share of newly-married men who have had at least one child. The latter age profile is informative about the effect of pre-marital children on marriage probability. We also target the coefficient on male wages in a regression of marriage transition probabilities; see Section 4.2.3 and Appendix D.2 for details. Table 6 shows the resulting parameter estimates. Figures 5a and 5b in the main text and Figure 19 immediately below show model fits.

Table 6: Parameters for Family Dynamics

Parameter Name	Parameter	Value, Non-College	Value, College
Children (age coefficients)			
First child, pre-marital	$\phi^n_{sn,0,j}$	$(-3.159, 0.062, -0.667)$	$(-3.851, 0.003, -0.318)$
First child, married	$\phi^n_{mr,0,j}$	$(-0.086, -0.146, 0.019)$	$(-1.986, 0.171, -1.181)$
Second child, pre-marital	$\phi^n_{sn,1,j}$	$(-2.122, 0.121, -0.893)$	$(-1.973, -0.212, 0.500)$
Second child, married	$\phi^n_{mr,1,j}$	$(-0.868, -0.014, 0.099)$	$(-1.013, 0.010, -0.071)$
Third child, pre-marital	$\phi^n_{sn,2,j}$	$(-1.544, 0.063, -0.832)$	$(-3.067, -0.366, -5.533)$
Third child, married	$\phi^n_{mr,2,j}$	$(-1.018, -0.094, 0.084)$	$(-1.863, 0.026, -0.465)$
Young children age	$\phi^a_{yc,j}$	$(-4.220, 0.186, -0.290)$	$(-4.547, 0.188, -0.174)$
Old children age	$\phi^a_{oc,j}$	$(-14.964, 0.640, -0.734)$	$(0.993, 0.084, -9.937)$
Relationship Dynamics			
Initial relationship distribution	(sn, rl)	$(0.572, 0.396)$	$(0.319, 0.442)$
Relationship, age	ϕ^{rl}_j	$(-1.991, -0.132, -0.164)$	$(-2.428, -0.134, 0.486)$
Engagement	ϕ^{en}	-0.85	-0.85
Marriage	ϕ^{mr}	0.4	0.4
Effect of pre-marital child	ϕ^{owb}	-0.546	4.689
Impact of wage shock	θ	1.990	1.325
Divorce, $n < 3$	$\phi^d_{n,j}$	$(-1.741, -0.282, 0.490)$	$(-4.026, 0.011, -0.883)$
Divorce, $n = 3$	$\phi^d_{3,j}$	$(-1.199, -0.199, 0.294)$	$(-7.335, 0.302, -0.766)$

Note: Superscripts are used to distinguish parameters, while subscripts dependencies. All parameters with the age subscript j utilize a quadratic in age. See Section 4.2.3 and Appendix D for details.

Figure 19: Number of Children by Marital Status, Model and Data



Source: Sample is men age 19 - 50. Ages 19 - 22 include only men with less than a four year college degree; ages 23 - 50 include all education groups. Never-married men are those who at the age in question have yet to marry. Data correspond to the NLSY79. Model results are author calculations; see Section 4.2.3 and Appendix D for details.

D.2 Supplemental Estimates: State-Level Wages and Marital Transitions

Table 7 shows results from a linear probability regression of marriage on male wages. We transform wages using the inverse hyperbolic sine function. This allows for a (near-) logarithmic relationship when wages are positive, but also accomodates values of zero. The first column of the table shows the results from an OLS regression. The estimated coefficient on wages is 0.0092. The second column shows the results for an IV regression where we instrument for each individual's wages with the average wages in his state of residence. The F-statistic for state-level wages in the first-stage regression is 254.69, highly significant and indicative of instrument relevance. Instrumenting for wages causes the coefficient to increase to 0.0144. This is the coefficient value we target when estimating our model of relationship dynamics.

Table 7: Predictors of State-Level Marital Transitions

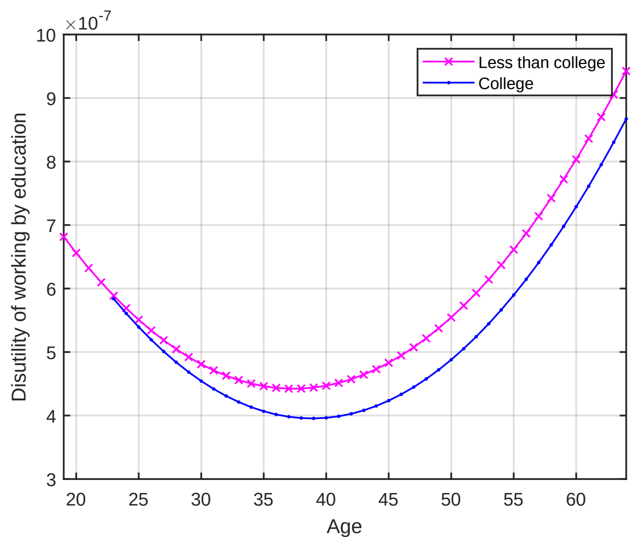
	OLS	2SLS
Constant	0.0206^{**}	0.0252^{**}
	(0.0082)	(0.0110)
$asinh(wage)$	0.0092^{***}	0.0144^{*}
	(0.0008)	(0.0083)
Age	0.0065^{***}	0.0059^{***}
	(0.0014)	(0.0017)
$\text{Age}^2/100$	-0.0279^{***}	-0.0250^{***}
	(0.0096)	(0.0107)
College +	0.0124^{***}	0.0089^{***}
	(0.0030)	(0.0062)
New child	0.5300^{***}	0.5288^{***}
	(0.0102)	(0.0104)
Year FEs	*Y*	*Y*
State FEs	*Y*	*Y*
R^2-adj	0.10	0.10
N	26290	26290

Source: the 1982-2019 waves of the CPS ORG. Sample is men age 19 - 54.

E Work Disutility

Figure 20 shows how the estimated disutility of working, $\psi_{e,j}$, varies across the life cycle. As discussed in Section 4.3, for each education group, our estimate of work disutility is the quadratic function that allows the model to best fit the life-cycle hours profiles found in the NLSY79.

Figure 20: Work Disutility by Age and Education



Source: Author calculations, See Section 4.3 for details.