Productivity, Wages, and Marriage: A Case Study in Professional Athletics

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Abstract

The effect of marriage on productivity and wages has been long debated. A difficulty in estimating the effect of marriage on productivity is the lack of data that contain measures of both marital status and exogenous productivity. We fill this gap by using a sample of professional athletes from 1975 - 2007. Our results show that there is little correlation between individual measures of productivity and marriage, yet, wages are up to 15 percent higher for some married players. We find that married players exhibit more stable performance and teams with higher fractions of married players are more successful. (*JEL* J31, J44, J70)
Key Words: Productivity, Wage Gap, and Marriage

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1 Introduction

Are married men more productive? Empirical estimates of the effect of marriage on productivity and wages have been long debated in economics since seminal work by Becker (1973, 1974). The main conclusion in standard cross-sectional log wage regressions is that married men are estimated to earn roughly 10 - 40 percent higher wages than their single counterparts. However, whether or not this increase in wages is due to a causal effect of marriage on productivity has proven difficult to pin down due to the lack of readily available data that contain wages, marital status *and* objective productivity measures. We aim to fill this gap by directly measuring the impact of marriage on both productivity and wages using a unique database that we compiled on professional athletes.

There are a number of proposed explanations for why married men earn more than their single counterparts. First of all, the positive correlation between marriage and wages may simply be due to selection. In particular, selection may be based on unobserved characteristics that are correlated with both marital status and productivity. Additionally, the positive correlation between marriage and wages may be due to reverse causality where men with high wages or high wage growth tend to be more successful in the marriage market. Alternatively, marriage may afford specialization between household and non-household work. Because men are freer to concentrate on non-household work, they therefore become more productive workers. Finally, employer discrimination is also considered as a possible explanation as married men are often seen as more reliable workers. Ultimately, the effect of marriage on productivity is of particular interest for analyzing gender-based discrimination in labor markets, as the male marital pay premium accounts for about one-third of estimated gender-based wage discrimination in the United States (Neumark, 1988). While the difference in earnings between men and women has shrunk since the late 1970s, a significant gender gap still remains.[1] However, if the male marital pay premium derives from

[1] See Altonji and Blank (1999) for a comprehensive survey of the gender discrimination literature.

increased productivity, then the proportion of the gender gap due potentially to discrimination may be overstated.

A notable feature of our analysis is that we use direct objective measures of productivity. Specifically, we consider professional baseball players, making use of data we hand collected from the National Baseball Hall of Fame and Museum data depositories and merged with a number of official productivity measures in baseball. This rich dataset allows us to directly assess whether there is a relationship between marriage and productivity. Overall, we find practically little connection between marriage and productivity.[2] Although professional baseball players are a unique subset of the population, the spotlight that professional athletics places on performance provides, what we put forth, is an *a fortiori* argument. If the relationship between productivity and marriage is fairly weak among this population then we conjecture that it is all the more weak among segments of the population where productivity is harder to gauge.

Interestingly, our results also show that marriage and earnings are positively correlated, even after controlling for selection. Married men in the top third of the ability distribution earn roughly 15 percent more than their single counterparts. In fact, while we find no impact on the level of productivity for these high-ability players, they do appear to exhibit increased stability as evidenced by a negative relationship between marriage and the variance of performance. If such stability has a causal impact on team revenues then managers may have reasons to "discriminate" in their favor. We also find evidence that overall team performance is improved as the fraction of married players increases, suggesting that the benefits to marriage lie less in increased individual productivity and more in the social and team building aspects.

2 Literature

Our analysis touches on the literature from a number of different areas. First, there is a vast literature that documents the very robust observation that married men earn

[2]One exception to this is the positive and statistically significant relationship we find between PEVA (a productivity measure) and marriage for for players in the lower third of the ability distribution.

more than their single counterparts. All studies, both cross sectional and panel data, typically include a measure of log wages for the dependent variable and a binary indicator for marital status, some variation of marital status (never married, cohabitation, divorced) or length of marriage along with other demographic controls such as age, education, experience and race. Attempts are made to control indirectly for cross-sectional variation in ability but cannot dismiss the interpretation that the results are driven by unobserved individual characteristics and the effect is overstated due to selection into marriage.[3] In other words, men with high unobserved ability exhibit characteristics that are more likely to be found attractive by both employers and potential spouses (for example, stability, industriousness, physical appearance, etc.)[4] Cross-sectional studies (for example, Bellas (1992), Blau and Beller (1988), Blackburn and Korenman (1994), Chun and Lee (2001), Duncan and Holmlund (1983), Hill (1979), Kenny (1983), Korenman and Neumark (1991), Krashinsky (2004), Nakosteen and Zimmer (1987), Schoeni (1995)) have typically estimated a marriage premium ranging between 10 - 40 percent.[5] Panel data results have been mixed, some studies find no statistically significant effect of marriage on wages while others find a residual positive effect (see, for Cornwell and Rupert (1995, 1997), Duncan and Holmlund (1983), Ginther and Zavodny (2001), Gray (1997), Hersch and Stratton (2000), Korenman and Neumark (1991), Krashinsky (2004), Loughran and Zissimopoulos (2009), Neumark (1988), and Stratton (2002)). Panel data studies with a residual positive effect generally conclude that there is some causal effect of marriage on wages, whether it is on productivity or merely discrimination is not completely resolved.[6]

[3]A number of papers have found evidence of sorting (among these Petersen, Penner and Hogsnes (2006) and Korenman and Neumark (1991)). They have found that the marriage premium disappears once controlling for profession. Given that our entire sample is in the same profession, the sorting issue is of significantly less concern, though, it is true that the type of man that selects into professional baseball is not necessarily representative of men in general. We address this concern in Section 10.

[4]Krashinsky (2004) and Antonovics and Town (2004) have used first differenced data on twins to account for unobserved ability. The first study finds that the marriage premium is statistically indistinguishable from zero among twin pairs while the latter finds that the marriage premium remains positive and significant.

[5]A number of papers [see, for example, Loh (1996)] have also considered cohabitation status as separate from never-married and typically find a cohabitation premium that is less than the marriage premium but nonetheless positive and significant. Stratton (2002) also considered cohabiters but found that once taking into unobservable individual effects, the premium disappears.

[6]See Ribar (2004) for a review of the methodologies.

The causal impact of marriage on productivity has received indirect support in the literature. The aforementioned papers that found a residual effect of marriage on wages, after controlling for individual fixed effects and other controls, generally interpret the effect as arising from specialization. Attempts have been made to test this causal explanation by controlling for hours worked by the wife. Evidence is mixed. Many of the papers that have contributed to this literature, for example, Daniel (1993 and 1995), Gray (1997), and Chun and Lee (2001) find a wage penalty associated with wife's labor hours. On the other hand, Hersch and Stratton (2000), Loh (1996), Jacobsen and Rayack (1996), and Hotchkiss and Moore (1999) find little to no evidence that wives' labor force participation underlies the decrease in the return to marriage for men.

To our knowledge, there are three papers that make use of productivity measures and are therefore particularly relevant for our study. Korenman and Neumark (1991) use data from a personnel file of a large U.S. manufacturing firm from 1976. The data contain supervisor performance ratings that provide a measure of worker productivity aside from the worker's wage. The authors attempt to measure productivity, albeit somewhat subjectively, and find that nearly all of the return to marriage (from 23 percent to 2 percent) disappears once adding pay grade and performance rating dummies. Mehay and Bowman (2005) use administrative data on male U.S. Naval officers in technical and managerial jobs to explore the effect of marriage on several job performance measures (e.g. promotion outcomes and annual performance reviews). They find that married men receive higher performance ratings and are more likely to be promoted than non married men. In both cases, however, these are subjective measures as it is plausible that supervisors simply perceive married men to be more productive workers and therefore give them higher performance ratings or grant them more frequent promotions.[7] Finally, Hellerstein et al. (1999) use manufacturing firm level data to estimate relative marginal products of various worker types, in particular married versus single. They then compare these estimates to wages. They find that differences

[7]In a similar vein, Stauffer and Buckley (2005) find that supervisors give lower performance ratings to workers of the opposite race.

in wages between ever married and never married men reflect a corresponding productivity premium. However, a weakness of their empirical approach is that they cannot distinguish between the causality and selection hypotheses.

The productivity measures we use, alternatively, are objective measures based on exogenous, historical measures of productivity. These objective measures of productivity have been extensively used in the sports economics literature mainly for analyzing the role of labor contracts and more generally for studying the specificities of the baseball labor market (Kahn, 1993; Macdonald and Reynolds, 1994; Rottenberg, 1956; Scully, 1974; Zimbalist, 2003), and the role of strategic management (Porter and Scully, 1982; Smart, Winfree and Wolfe, 2008). Sports data has also been used to address issues of race discrimination (Andresen and La Croix, 1991; Depken and Ford, 2006; Gwartney and Haworth, 1974; Hanssen and Andersen, 1999; Hill and Spellman, 1984; Lanning, 2010; Nardinelli and Simon, 1990; Price and Wolfers, 2010). The primary advantage for the use of such data is the availability of repeated measures of performance and visible characteristics of the player. The marriage premium is potentially another form of discrimination and whether or not differences in wages between married and single men are due to discrimination cannot be fully addressed unless productivity is also taken into account.[8]

3 A Model of Spousal Investment

> *There was one big glitch: these sorts of calculations could value only past performance. No matter how accurately you value past performance, it was still an uncertain guide to future performance. Johnny Damon (or Terrence Long) might lose a step. Johnny Damon (or Terrence Long) might take to drink or get divorced.*
>
> (*Lewis, 'Moneyball: The Art of Winning an Unfair Game'*, p. 136)

> *It was better than rooming with Joe Page.*

[8]Price and Wolfers (2010) argue that productivity measures themselves are potentially affected due to racial biases. We do not believe that this extends to our particular case of comparing married and single players. That is, we do not believe that an umpire, when making a split second call, takes into account marital status, a relatively non-salient characteristic of the player.

Joe DiMaggio's response when asked if his marriage to Marilyn Monroe was good for him.[9]

In this section we sketch a model and provide intuition for the effect that marriage has on spousal productivity and wages.[10] We assume here that marriage impacts wages through two channels. First, marriage impacts wages indirectly ("indirect spousal activities") because the wife engages in particular actions that impact the productivity of the husband. The main purpose of this involvement is to provide her husband with uncluttered time. She may also provide career advice and moral support or simply allow him extra sleep. Second, we also allow for marriage to impact wages directly ("direct spousal activites") as opposed to indirectly via productivity. These direct influences can take on a number of forms that may lead employers to favor married men. For example, a wife may impact her husband's popularity and visibility through public image (for example, hosting formal dinners, participating in public events, charity events, etc.) or marriage may increase a man's stability, reliability (among other characteristics) that in turn make him a better employee/teammate. Like many high profile professions, a professional athlete's career is accompanied by numerous formal and informal expectations and therefore not only is the management of the athlete's self-image important, but that of their wives is crucial too. The wife represents her husband to the public, providing a visible link between the worlds of work and family (Crute, 1981).[11] In sum, through these two channels, the wife is able to take actions that make each unit of her husband's time in the market more effective and/or more profitable.

Thus, a husband's wage is a function of direct spousal activities and productivity while productivity is, in turn, a function of indirect spousal activities and innate ability. Both are also functions of other demographic characteristics such as age and race as well as variables such as experience. We assume further that these variables af-

[9]Granted, DiMaggio was retired by the time he married Monroe, whom, by any standards, was not a typical ballplayer's wife.

[10]Our model is inspired by Daniel (1993). Without loss of generality, we assume that it is men that potentially benefit from marriage, though, it would be more accurate to state that it is the higher earning spouse that potentially benefits.

[11]"A wife's look and behavior...can even affect her husband's baseball career. You are part of the package, and if you don't look the part, well, some are going to notice." (Gmelch and San Antonio, 2001).

fect men of varying ability levels differently. We can therefore model productivity and wages as follows:

$$P(\rho, t, X) \quad \text{and}$$

$$S = S(P, \tau, X), \tag{1}$$

where P represents productivity, S is yearly salary, τ is the direct and t the indirect activities that impact spousal wages, and X is a vector of other variables that impact productivity and wages, such as age, race, and experience, among others. Ability is captured by ρ, where higher numbers represent higher innate ability.

We focus on the particular case of our model where wives invest solely in their husbands and do not work. In addition, leisure is predetermined for both spouses in order to abstract from the labor-leisure decision.[12] There are a number of interesting implications from this simple model. For instance, suppose that two men have different ability but equal productivity, that is, $\rho_1 > \rho_2$ but $P(\rho_1, t_1, X) = P(\rho_2, t_2, X)$. Under the assumption of monotonicity of $P(.)$, $t_1 < t_2$ and therefore $\tau_1 = T - t_1 > T - t_2 = \tau_2$. In words, conditional on equal productivity, the wives of higher ability men spend less time on indirect and more time on direct spousal activities than the wives of lower ability men. As a result, $S(P(\rho_1, t_1, X), T - t_1, X) = S(P(\rho_2, t_2, X), T - t_1, X) > S(P(\rho_1, t_1, X), T - t_2, X)$ by monotinicity of $S(.)$. Another way to think about it is as follows: in the case of differing abilities but equal time spent on indirect spousal activities, that is $\rho_1 > \rho_2$ and $t_1 = t_2$, we have $P(\rho_1, t_1, X) > P(\rho_2, t_2, X)$. Provided $P(.)$ is quasiconcave, the marginal impact of an increase in t is decreasing in ability.

[12]The assumption of setting labor hours equal to zero for the wife would also arise endogenously from the model given sufficiently large husband wages relative to wives. With rare exception, MLB players earn wages that are much higher that any wage their wives could earn, which discourages wives' participation in the labor market. Moreover, there is also anecdotal evidence that the demands of a professional baseball career do not facilitate a stable lifestyle where wives could invest in their own careers. The far majority of wives of MLB players do not work outside of the home as they maintain the household. (Source: email correspondence with Denise Schmidt, attorney for the Baseball Wives Charitable Foundation.)

Families maximize utility subject to standard budget constraints

$$\max_t \quad u(C) \qquad \text{subject to}$$

$$\begin{aligned} C - S(P(\rho^m, t^f, X^m), T - t^f, X^m) + Y \leq 0, \\ \tau^f + t^f \leq T, \\ C, \tau^f, t^f \geq 0, \end{aligned} \tag{2}$$

where, in addition to the variables described above, C is consumption, and Y is nonwage income. The indexes m and f represent male and female, respectively.

The first order condition with respect to t is as follows:

$$S_1(P, T - t^f, X) \cdot P_2(\rho^m, t^f, X^m) \leq S_2(P, T - t^f, X^m) \tag{3}$$

where equality holds in the case of an interior solution (that is, the spouse does not desire to spend more than T hours on spousal activities). The left hand side of equation (3) reflects the return to indirect augmentation while the right hand reflects the implied return on direct augmentation. For a given value of ρ, the wife equates the marginal value of one more unit invested in τ_f with the marginal value of one more unit invested in t_f. In this model, both spouses are fully invested in one career. Wives form a work pattern that Papanek (1973, p.90) has labeled the "two person career," characterized by "...a combination of formal and informal institutional demands ... (are) placed on both members of a married couple of whom only the man is employed by the institution."

4 A Primer on Baseball

Professional athletes are a subsample of the population where direct measurements of productivity are observable. In contrast to other team sports, such as basketball and soccer, performance in baseball is directly quantifiable and with a number of measures that are relatively independent of the actions of the player's teammates. Moreover, while there have been changes in the rules over time, relatively speaking, baseball is a fairly stable sport with a long history of uniform player statistics collection. The current typical baseball season is 162 games and runs from early April until early October, followed by the post-season series in October that culminates with the World Series. The regular season is typically divided into 81 "home" games, that is, games played in the team's home stadium and 81 "away" games. There are two main types of players in baseball: pitchers and batters, each with their own productivity measurements.[13] The role of pitchers is to prevent the other team from scoring runs, while the role of batters is score runs for the team. The overall goal in the game is to score more runs than the opposing team.

4.1 Productivity Measures

As will be discussed in Section 5, we center our analysis on batters. There are numerous measures of productivity for batters, and experts disagree as to which is the "best." We focus on a number of well accepted measures, the simplest of which is the "Batting Average" (BA). BA is defined as the number of hits divided by the number of opportunities to bat ("at-bats") in a season. Another conventional measure is "On-Base plus Slugging" (OPS), which measures the number of ways a batter can get on base (hits, walks and hit by pitch) with a measurement of the player's ability to hit for power (a weighted average of the number of bases reached per at-bat). We also consider two other measures "Wins Above Replacement" (WAR) and "Performance Evaluation Value" (PEVA). WAR is a measure that is meant to capture the value of a player (in terms of wins) to the team and represents the number of wins a player provides the team above what a team would win were it to replace the player with an average minor league player off the bench. PEVA, like WAR, is meant to provide an overall player rating. PEVA uses a complex formula to measure the overall sta-

[13] Pitchers are often batters as well but they are judged by their pitching and not by their batting performance. While there have been players that have excelled in both roles (for example, Babe Ruth), generally speaking, pitchers tend to be weak batters.

tistical performance of the player in a year. The measure compares players against other players' performance in a peer-to-peer era review. The first two measurements are calculable from Sean Lahman's Baseball Archive (www.baseball1.com). WAR is obtained from Sean Smith (www.baseballprojection.com) and PEVA from *Stat Geek Baseball* (www.baseballevaluation.com). For each case, a higher number represents higher productivity.

The main measure of team level success is winning percentage, the number of games won divided by the number of games played. Other measures that we consider are whether or not the team is a division winner and ballpark attendance that reflects overall team popularity. All three measures are also obtained from the Baseball Archive.

4.2 Wage Setting

Salaries are notoriously complex in baseball with a number of important changes over the past few decades. In 1975, the courts struck down the so called "Reserve Clause." The Reserve Clause, which was standard in all player contracts at this time, stated that upon the contract's expiration, the rights to the player were to be retained by the team with which he had signed, effectively gaving the team market power over the player. Post-1975, players are generally considered to be valued at closer to their true market prices at all stages of their careers.

Figure 1 graphically illustrates the effect of the elimination of the Reserve Clause. The Figure breaks down the sample into players with less than six years of experience and greater than or equal to six years. While, technically, the elimination of the Reserve Clause directly impacted those players with six or more years of experience, the figure shows that the increase in earnings was not limited to only those players. Under the expectation that a player would eventually become a free agent, a player is potentially able to extract economic rents earlier in his career. As can be seen, salaries began to more steeply increase post-1975 for all players. Thus, if marriage has an effect on earnings, we would expect that its effect would be stronger post-1975 when salaries could more freely respond to market factors.[14]

5 Data

The main database we use comes from the Baseball Archive, an extensive database which is copyrighted by Sean Lahman (http://www.baseball1.com). It contains detailed yearly performance information on players and teams from 1871 through the current season (2007 at the time of data collection). Since the inception of professional baseball, there have been roughly 16,000 players (and just over 83,000 player-years) that have played in at least one Major League Baseball (MLB) game. Our contribution to the data was the addition of a number of variables: marital status, year of marriage, wages, and race. While these variables are generally publicly available, there is no standard electronic source, and were therefore hand-collected on site for each player using the vast archives of the National Baseball Hall of Fame and Museum (HOF) located in Cooperstown, NY, USA. The main data sources were the National Baseball Library and Archive player questionnaire collection and biographical clippings files, Major League team media guides, *The Sporting News Baseball Register*, 1940 - 1968 and Topps Baseball Cards, 1951 - 1990 (for race data). In addition, these main data sources were supplemented by player contracts, newspaper clippings and internet searches when necessary. Wages for players after 1988 were obtained from *USA Today*, which is regarded to be the most accurate source for more recent player wages. Prior to 1988, wages were not generally collected and made public and were therefore collected from various sources housed at the HOF. In addition, wage data is not at all available prior to 1905. Wages do not include deferred payments, signing bonuses and incentive clauses, nor do they include any income earned by endorsements, or other activities that are not included in the player's contract with the team. This could be of potential concern if we believed that single and married players have different preferences

[14]During the first six years in the league, players are under contract (with some exceptions) to a particular team. Beginning in 1974, after three years in the league, a player becomes what is called "arbitration eligible" and can renegotiate his salary, presumably for better terms. The best players, called "super-twos," may be eligible after two years.

for the makeup of their salaries. While it is quite difficult to verify this concern, we present evidence in the Appendix that married and single players do not sign contracts that systematically differ in length nor do they differ in the composition between base salary, incentive clauses and signing bonuses.[15]

We took a simple random sample from the full population of players[16] of 5,000 players (batters and pitchers) that represented 31,000 player-years and ultimately were able to recover data on marital status and/or year of marriage for roughly 27,500 player-years, wages (roughly 18,600 player-years), and race (roughly 4,800 players). We apply two main restrictions to the data. First, because pitchers (a fielding position) are not generally evaluated according to batting productivity measures, we drop them from the individual level analysis and reserve a parallel analysis of pitchers for future research.[17] All forthcoming statistics and empirical analyses apply only to batters. Second, because the elimination of the Reserve Clause had such an important impact on wage setting and incentives, we restrict our analysis to the post-1975 period.

There are some drawbacks to the data collection. First, we have no information on cohabitation, though it is certain that some fraction of our single players cohabit without a formal marriage. The extent that cohabiters experience some of the benefits of marriage only strengthens the findings. In addition, we also underestimate divorces due to the nature of the data collection. Player questionnaires were often loath to provide negative information on the player (such as substance abuse or divorce) and so we certainly attribute positive marital status to players who may well be divorced. Again, assuming marriage has an overall positive effect on our outcome variables, misclassifying divorced players as married only strengthens our results. Finally, we unsuccessfully attempted to systematically collect data on children but this proved to be rather difficult due to missing data and out-of-wedlock births.

[15] In addition, signing bonuses and incentive clauses represent relatively small fractions of total compensation – on average less than ten percent.

[16] This is generally the case. We provided the freelance researchers will sequential samples of 1000 players. Two of these random subsamples were restricted to more current years (one post-1948 and another post-1988) in order to collect more observations on black players (for a separate project) and increase the probability of finding wage data as it has been publicly available since the late 1980s.

[17] Some players perform both roles over their careers. We consider a player to be a pitcher if he pitches in more than one-third of his games.

Table 1 contains rookie year demographic information, productivity measures and other related variables. The first column represents the population of players between 1871 - 2007. The second column represents our full collected sample of batters and the final third column represents the actual sample used in our empirical analysis that is subject to our two main restrictions described above, in addition to other smaller restrictions as will be mentioned below. There are a number of reasons for the differences among the population and the two samples. First, while we started with a random sample of players, the final sample that was returned to us was not completely random due to data availability. Some players had very short, uneventful MLB careers and it was more difficult to find the relevant information for these players. Thus, we were slightly biased against finding low skilled players with short careers. Also recall that we stratified on years after 1948. This would affect variables such as wages and career length that have been trending up over time. Moreover, nearly 30 percent of all players played in only one MLB season and these players are lost in the final sample as we require at least two observations per player. Finally, in order to obtain accurate measures of productivity, we restrict our final sample to players that have at least 100 plate appearances.[18]

While the average values of our demographic characteristics for the hand-collected full sample of batters are fairly similar to the full population of batters, the final sample differs relatively more (we generally reject equality of means in standard t-tests). The race variables differ significantly between the full and final sample primarily due to the post-1975 restriction in the final sample.[19] Note that race categories are not necessarily mutually exclusive. Our main variable ($married_y$) is defined as a binary

[18]There is no set rule as to how many observations we need in order to have an accurate measure of productivity. As such, we chose a number of cutoffs to test the robustness of our ad hoc restrictions. Restrictions of 20, 50 and 100 plate appearances in a season provide similar results as does using all the data and weighting by plate appearances. For brevity, we present only the results based upon the 100 plate appearances restriction and other restrictions are available upon request.

[19]Until 1947, blacks were not allowed in the league until Jackie Robinson famously crossed over the color line. Blacks reached their peak in the early 1980s at around 28 percent of players. Today they stand at roughly 10 percent of all players. Race is notoriously difficult to collect because most data on race is collected by simply looking at pictures of players, for example, baseball cards. At times, particularly with dark-skinned Hispanics or lighter-skinned blacks, it is difficult to determine race. Moreover, it is uncertain with which race the players themselves identify.

indicator equal to one if the player is married in year y, zero otherwise. Sixty-nine (75) percent of our sample observations are married player-years in the full (final) sample. More precisely, 39 (35) percent of players marry prior to beginning or in the first year of their careers, while another 36 (46) percent marry at some point during. Seven (.01) percent of players are single during their entire careers but marry at some point after the career ends, and the remaining 18 (19) percent never marry as of 2007.[20] For players who marry, we also collected the year of marriage when available.[21] The average number of years married is higher in the final sample at 5.8 years compared to the full sample at 4.3 years. Finally, average income (adjusted for inflation) across players is quite high at over $457,000 in the full sample and over $967,000 in the final sample. This is primarily driven by the fairly steep increase in wage growth that began to occur in the mid-1970s. The standard deviation in wages has also increased over the years, roughly tripling between 1905 and 2007.

The remainder of the table contains information on the productivity measures and other important variables for the analysis. Similar to the demographic characteristics, we reject equality of means between the population and each of the samples where the productivity measures in the samples are overall higher than the population as a whole (for reasons previously discussed).

[20]The last category is problematic because until a player has died, we cannot say for certain he never married. Thus, a player who has been single prior to, throughout, and after his career (if finished) as of 2007 is classified as never married. Of course, he may marry during a later year of his career or after his career ends.

[21]If a player married in January through March in year y then we recorded his year of marriage as y. If he married April through December then we recorded his year of marriage as $y + 1$. This is account for the fact that contracts are generally established for the MLB season by April.

6 The Effect of Marital Status on Individual Productivity and Earnings

6.1 Productivity

The extensive panel data available from The Baseball Archive allows us to follow a large sample of players over the span of their careers. Identification in the fixed effects specification is derived from the 46 percent of players that switch marital status at least once during their careers while an OLS specification uses variation in marital status across players and time. It is obvious that marital status is not the only factor that potentially affects productivity. In addition to the aforementioned demographic information, we also include team-ballpark, fielding position, manager, and year fixed effects as well as indicator variables that capture major rule changes that may impact productivity and/or wages.

Our baseline specification is:

$$PROD_{iy} = \gamma_0 MAR_{i(y-1)} + x'\gamma_1 + \alpha_i + \tau_t + \pi_p + \delta_y + \mu_m + \varepsilon_{iy} \tag{4}$$

where i and y indicate person and year indexes, respectively. Our main coefficient of interest is γ_0 that captures the mean effect of marital status on productivity (BA, OPS, WAR or PEVA). Marital status is lagged by one year reflecting the fact that the effect of marriage may occur with a delay.[22] The vector x includes a number of individual characteristics as described in Table 1. These include binary indicators for race (not mutually exclusive), height and weight in rookie year, binary indicators of right and left-handedness (not mutually exclusive), age and its square, experience and its square, lagged number of games played in the season (as a proxy for injuries) and binary indicators for three or more years experience in MLB and six or more years experience in MLB (meant to capture wage setting rules). Finally, α_i, τ_t, π_p, μ_m and δ_y represent in-

[22]None of the results are sensitive to this particular specification. Contemporaneous values or additional lags of marital status provide similar results. Results available upon request.

dividual, team-ballpark, fielding position, team manager, and year fixed effects.[23] The idiosyncratic error term is represented by ε_{iy} and is clustered by player. As previously noted, our preferred estimation is an unobserved effects model that controls for time invariant individual characteristics, particularly ability. Thus, any residual effect of marital status should reflect its causal impact on the productivity measures. In this specification, we include only those control variables that vary nonlinearly over time. These include the squared age and experience terms, the lagged value of games played, three or more years experience in MLB, and six or more years experience.

Consider initially the first row of Table 2. We see that the simple indicator for the lagged value of marital status is not correlated with standard productivity measures at any conventional level of significance. For example, in column 1 of the top row, the effect of the lagged value of marital status is a decrease in batting average of 0.001 points – an insignificant and small effect given the mean batting average of 0.249 (std dev of 0.072).

An interesting pattern is revealed once we divide the sample based upon the initial expected ability levels. More precisely, we break the sample down into three roughly equal groups based upon the distribution of rookie year plate appearances (what we term "low," "medium" and "high" expected ability) of the population of players within team.[24] We use plate appearances as a proxy for expected ability and skill - we assume that a player that is expected to perform well will be given more play time, all else equal.[25] Granted, the number of plate appearances in the rookie year is not a perfect measurement of expected ability as, for example, teammate injuries and position in the batting lineup also impact plate appearances. Using an alternative proxy such as

[23]It is possible to also consider team an outcome variable as better players may switch to better teams. The results are not sensitive to the exclusion of team fixed effects. Also note that we cannot separately identify the team fixed effect from the ballpark fixed effect because while teams switch ballparks, ballparks do not switch teams. Thus, the τ_t indicators should be interpreted as joint team and ballpark fixed effects. Team-ballpark indicators also control for league effects (i.e., National League or American League).

[24]We focus on the comparison between low and high ability players and exclude those defined as medium ability. For the most part, the results in this paper for medium ability players look similar to those of low ability players.

[25]We also adjust the measure to take into account players that begin mid season by normalizing by the fraction of the season played.

rookie year batting average to generate the groups provides overall similar results.[26] While statistical significance is not consistent, the low ability group repeatedly shows a positive point estimate for the effect of marriage on productivity. Married, low-ability, players have batting averages that are six points higher in the OLS specification and eight points higher in the FE specification. These results, however, are not statistically significant at conventional levels. OPS, is consistent in terms of the point estimates but also lacks any finding of statistical significance for any of the groups. WAR and PEVA confirm significant correlation in most specifications between marital status and productivity for players in the low ability group. In particular, WAR shows significant correlation at a five percent level in the OLS secification and PEVA shows significant correlation at a five percent level in both OLS and FE. Married, low-ability players score roughly between 17 - 25 percent higher than single players based on the average post-1975 PEVA of 4.83 for this group. Across the board, the point estimates for the low ability group are of many magnitudes larger than high ability players and the data as a whole. The high ability group, in constrast, shows relatively small point estimates and signs that flip between negative and positive estimated effects when moving from OLS to FE. Nothing is significant at conventional levels, providing no evidence that marriage is correlated with higher productivity for the high ability group, on average.

Before moving to the earnings analysis, we return briefly to the model from Section 3. One of the predictions from the model is that the wives of low ability men invest more in indirect as opposed to direct augmentation. The results from this section lend support to the idea that any potential effect on wages of low ability players is at least partially coming from their increased productivity. High ability players experience no such impact on productivity and therefore, any potential impact on wages would have to come from the direct augmentation activities. In sum, while marriage may overall impact the wages of the different ability groups, the mechanism differs between them.

[26]We also collected and computerized in spreadsheet format all rookie year draft data going back to 1965 under the assumption that better players are picked in earlier rounds. This proved, somewhat surprisingly, to be rather uncorrelated with any measure of future performance.

6.2 Salary

The previous Section established that we estimate a consistently positive point estimate for marital status for low ability players [27] and no statistically significant robust effect on productivity for any of the other players. We next check whether there is any evidence that marital status impacts log salary as has been found in much of the previous literature. We reestimate Equation 4 replacing the dependent variable, productivity, with the log of salary. In addition, we also add a measure of productivity thereby allowing for marital status to have a direct impact on salary as opposed to only the indirect impact through productivity.

Broadly speaking, the results from Table 3 show no evidence of a direct effect of marriage on earnings when considering the whole sample or the low ability group. [28] However, once controlling for time invariant characteristics, married, high ability players are estimated to earn roughly 14 to 15 percent higher than their single counterparts (columns 3 and 4). This result is particularly interesting because it holds for a given level of experience and performance. Moreover, it does not appear to be due to higher productivity levels afforded by marriage. In the subsequent sections, we further investigate this result and its justification.

6.3 Years of Marriage

We next investigated whether the productivity and salary effects depend on the number of years married. We estimated the following equation and present the results graphically in Figures 2 and 3.

$$y = \beta_k \sum YM_{iy} + x'\gamma_1 + \alpha_i + \tau_t + \pi_p + \delta_y + \mu_m + \varepsilon_{iy} \tag{5}$$

where y represents productivity (PEVA) in one specification and log earnings in another. The variables YM represent binary indictors for each year of marriage, be-

[27] Again, we acknowledge that these results are sensitive to the particular productivity measure and the empirical model

[28] Columns 1 and 2 report the OLS results, while columns 3 and 4 refer to FE estimates

ginning with the first year after marriage and running through ten years.[29] The base category is the five years prior to to marriage, thus, we interpret the β_k as relative the the average productivity or log earnings in the years prior to marriage. The remaining controls are identical to those discussed in Section 6. The sample is restricted in this case to those players who eventually marry (though may not necessarily have positive years of marriage in the sample) because otherwise YM is undefined. As before, we include all of the demographic and other controls. As Figure 2 shows, the cumulative impact of marriage on productivity is fairly noisy and statistically insignificant for both low and high ability players. Thus, the positive and significant result we found for the low ability players in Table 2 is not robust to this specification variant. Moving next to Figure 3, there is a negative relationship between years of marriage and salary for low ability players but no year shows a statistically significant effect. In contrast, high ability players show a strong positive relationship between years of marriage and salary with the peak occurring at four and a point estimate of 0.31. Statistical significance is concentrated in the earlier years of marriage and while the impact remains positive, we no longer reject the null at conventional levels beyond six years.[30]

7 The Effect of Marital Status on Team-Level Success

We next analyze the data at the team level and consider the effect of the average number of married players on a team on various measures of team success. Team level summary statistics are presented in Table 4.[31] Due to insufficient sample size at the team-year level for the martial status variable, we, unfortunately, cannot break the

[29]Beyond ten years of marriage, the sample size quickly becomes small and the data noisy.

[30]We note here that because divorce is underreported in some cases and, likely to be a greater problem as the measured years of marriage increase, it is possible that there is attenuation toward zero in later years of marriage.

[31]Note that these statistics are not simply due to our aggregating the micro data to the team level. The Baseball Archive provides all statistics at the team level in addition to the individual level.

sample down by ability as we did in the individual level analysis.[32]

Similar to Equation 4, we estimate the following at the team level:

$$y_{ty} = \gamma_0 AVGMAR_{t(y-1)} + x'\gamma_1 + \tau_t + \mu_m + \delta_y + \varepsilon_{ty} \tag{6}$$

where y represents three measures of team success–team winning percentage (wins divided by total games), a binary indicator of a division win and stadium attendance. Each is regressed upon the lagged fraction of married team members ($AVGMAR$), x that contains team average batter and pitcher productivity and the fraction of home games out of total games, and manager and year indicator variables. The final two columns also contain the lagged winning percentage and a lagged binary indicator for a World Series win.[33] Even columns present OLS results and odd columns present FE results. Overall, the results show a positive and statistically significant correlation between the average fraction of married players at the team level and winning percentage (columns 1 and 2). Increasing the fraction of married players by ten percentage points (from a mean value of 69 percent) is associated with a 0.34 percentage point (0.68 percent) increase in the winning percentage in the OLS specification and 0.28 percentage points (0.56 percent) increase in the FE specification. In addition, there is also a positive correlation with the probability of a division win (columns 3 and 4), though statistical significance is weaker. Increasing the fraction of married players by ten percentage points is associated with a roughly two percent increase in the probability of a Division win. Finally, the fraction of married players is significantly and positively correlated with ballpark attendance even when controlling for traditional factors associated with attendance, such as lagged values of team success (winning percentage, World Series win). A ten percentage point increase in the fraction of married players is associated with a 2.2 - 2.7 percent increase in attendance per game, roughly 43,000

[32]We also include pitchers in the calculation of the average marriage rate as the team-level outcomes are not dependent upon the individual positions played.

[33]We would also like to include total team budgets as an explanatory variable as its clear that teams with larger budgets can afford to attract the most highly skilled players but historical values of total budgets prior to 1988 are extremely difficult to find. Team-ballpark fixed effects should capture overall average level differences in budgets across teams.

- 54,000 yearly attendees. These latter results support the hypothesis that married players may have positive benefits to teams that manifest themselves in greater team popularity and success and lend some explanation as to why team managers and owners may favor such players.

8 Threats to Identification

In this section, we address a number of remaining issues that potentially impact our empirical results.

8.1 Nonrandom Attrition

Parametric and nonparametric hazard models confirm that married players have, on average, longer careers than single players (unreported). Moreover, taking arbitrary career lengths such as three, four or five years, we found that in a cross-section, when regressing binary indicators for having a career length of at least three, four or five years on marital status, productivity and other demographics, we found that marriage always had a positive and significant effect. Both of these results confirm that marriage is somehow correlated with career longevity, though, a priori, do not eliminate the possibility that it is simply time-constant unobserved ability that explains the correlation.[34]

We take a straightforward approach to addressing this issue: sample restrictions on experience.[35] In this approach, we cut the sample at various years of experience to test the sensitivity of the point estimates to the attrition problem. We assume that the

[34] In order to eliminate the mechanical relationship between marital status and longer careers (i.e. it is precisely because certain players have longer careers that we observe them getting married), we repeated the test where we checked whether marital status in the first three years of the career affects the probability of having a career that lasts six years or more and we again confirmed the positive and significant effect of marriage.

[35] A second approach to dealing with the nonrandom attrition problem could be the use of median regression. The idea here is that we are mostly concerned with correlation of time-varying marital status and exit at the lower end of the distribution. Players with sufficiently high ability may be able to experience negative "shocks" to productivity and not be in danger of exit, whereas this same negative shock to a player with low initial ability may be enough to cause his exit from the sample. Median regression is less impacted by the extremes of the sample and intuitively less impacted by the attrition problem. This approach, however, is proving to be extremely computationally intensive and left for future research.

attrition problem is less severe at lower cutoffs. Table 6 replicates the main FE models from Tables 2 and 4, though, for brevity, we present only the results for PEVA. Each of the first columns incrementally restricts from 4 to 20 years of experience. Here we are interested primarily in the stability of the point estimate, particularly when statistically significant. The top panel of Table 6 (full sample) presents fairly stable point estimates though confirms the lack of statistically significant correlation between productivity and salary with marital status we found in Tables 2 and 3. The second panel of low ability players is similarly consistent. The point estimates on marital status in the productivity regression are rather stable across the sample restrictions on experience, while those in the salary regressions are consistent with the lack of any robust correlation between marital status and salary. The third panel of high ability players shows roughly the reverse result. The productivity regressions confirm the lack of correlation between individual performance and marital status while the salary result is fairly robust to experience levels, in particular beyond four years of experience.[36] Overall, the stability in the point estimate over the experience restrictions suggests that attrition is not materially impacting our main findings.

8.2 Dynamic Selection

To our knowledge, Korenman (1988) is the only paper that tests for reverse causality and finds no evidence when regressing current wages on future marital status. We are able to undertake a similar test where we regress lagged salary on a binary indicator for marrying that is equal to one in the year of marriage and zero in years prior.[37] In addition, there are a number of improved tests that we can make use of the institutional setting unique to baseball that provides exogenous variation in salaries but is arguably uncorrelated with marital status. For a sample of players who are not married by their first year in the league, we can test whether they are more likely to

[36] While the results show no statistically significant impact for four years or less of experience, this is not surprising as salaries are often fixed for the first three years of experience.

[37] Players then fall from the sample once married.

get married after their third year or sixth year when wages tend to jump.[38] Second, we can check how productivity impacts the probability of marriage. If a player performs well, there may be increased expectations that he will eventually be compensated with a higher salary once he can renegotiate. Thus, while his current salary is not at his full earning potential, high levels of productivity may predict an increased future salary and propensity to marry. The fact that we are able to control for current productivity greatly improves the ability to test for dynamic selection.

Table 7 presents the results. The dependent variable is a binary indicator of whether or not the player marries in year y. As in prior regressions we include all the OLS controls. We estimate all the models using standard OLS so that we allow for time constant unobservables to partially explain the probability of getting married, thereby biasing the results against us. As before, we present the results for all players, low- and high-ability separately. Looking down columns 1, 4, and 7, the results show the lags of income are not statistically significant predictors of marrying. Neither are indicators for post-third and sixth year of experience (columns 2, 5, and 8), nor lagged values of productivity (columns 3, 6, and 9). In all cases, we tested the joint significance of the lagged variables (for example, $log(salary)_{y-1}$ and $log(salary)_{y-2}$) and find that we do not reject the null hypothesis. In sum, none of the specifications show that lags of salary or productivity are statistically significant predictors of future marital status, suggesting that our main findings are not obviously driven by reverse causality.

9 Discussion

The results presented thus far have established a direct effect of marriage on earnings for high ability players with no corresponding impact on individual productivity measures. In contrast, there is some weaker evidence of a positive correlation between marriage and individual productivity for lower ability players but this does not appear to manifest itself in higher earnings.

[38]The player is eligible to renegotiate his salary after three years in the league and becomes a free agent after six years.

Thus, in order to justify the higher salaries of high ability married players, we hypothesize that there must be some added benefit to teams to having such players that we have not fully captured by considering only the standard individual level productivity measures. The team level results provide some evidence of this. While married players are not generally found to be more productive, what is often important from the team's perspective is "the bottom line," the marginal revenue that married players generate may be higher than single players. This may be due to the image and popularity of a player increasing the fan base or perhaps more subtle benefits to the team that are not captured by batting productivity. Marriage may lead to stability, reliability, maturity and leadership skills that single players of the same ability level are less likely to have. This interpretation is in line with the three-factor model of interpersonal trustworthiness (ability, integrity, benevolence) established by Mayer, Davis and Schoorman (1995). All three factors of ability, benevolence, and integrity can contribute to trust in a group or organization. There are a number of variables that should be correlated with the positive aspects of image, stability and leadership skills that we can analyze.

First, using a subsample of our data from 1990 - 1993, we checked whether married players have greater "star" power than single players where star power is calculated as the difference between the player's total marginal revenue product and marginal revenue product based only on performance.[39] We estimate using OLS, as there is not sufficient variation within player in marital status over such a short time period (less than five percent of players switch marital status.) While we do not find that married players have greater star power than their single counterparts, we do find that the highest ability married players are exploited less where "exploited" is defined as the difference between total marginal revenue product and salary. We find that high ability married players are exploited about 10% less [se of 4.3] In other words, married players in this group extract more of their economic rent. This result may imply that high ability married men are able to negotiate a higher salary for a given marginal

[39]The data come from Dunn and Mullin (2002) and cover players from 1990 - 1993. Refer to their article for details on how the variables are calculated.

revenue product. There are a number of intuitive explanations. Perhaps wives push their husbands' to harder negotiate or perhaps marriage increases the self-worth of the player. Interestingly, we do not see any analogous difference between single and married players of the low ability group suggesting that a high level of innate ability (and, perhaps, status) is arguably a necessary requirement to give the player market power.

Next, we considered whether married players are more likely to become "all-star" players, where "all-star" is a measure of player popularity and skill, among other factors. We find no statistically significant effect of marriage on the probability of being chosen to be an all-star player (unreported but available upon request). Finally, we checked whether marital status has any impact on performance stability. We look at the effect of marital status on the coefficient of variation of productivity (PEVA) using a three year window.[40] Figure 4 displays the results. As the Figure shows, there is no stabilizing effect of marriage on performance for low ability players but there is a fairly robust one for high ability players. Thus, while marriage appears to have no statistical effect on the level productivity itself, there is an impact on the variance of this productivity. Married, high ability players exhibit more consistent performance and, conceivably, it is this consistenc that is rewarded in the marketplace.

10 Conclusion

Using a large sample of professional baseball players, this paper aims to investigate the effect of marriage on male productivity. The novel contribution of our approach is that we use historical and exogenous measures of productivity in a panel data setting, allowing us to also directly test the hypothesis that marriage has a causal effect on earnings through its impact on productivity. We find heterogeneity in the effect of marriage on productivity where men in the bottom third of the ability distri-

[40]The coefficient of variation, equal to the standard deviation divided by the mean value of PEVA for each player, is calculated in rolling windows of three years. For example, the coefficient of variation in year y is calculated from the mean and variance of PEVA from years $y-2$, $y-1$ and y.

bution experience a relatively large and positive effect–though statistical significance is quite sensitive to the productivity measure and empirical model used. Players in the top third of the ability distribution experience no statistically significant relationship between marital status and performance. Interestingly, these latter players earn approximately 15 percent more than otherwise comparable single players, even when controlling for selection into marriage and productivity. These findings are suggestive of the varying roles that marriage plays along the underlying ability distribution. At lower levels of ability, men benefit more from what we term "indirect augmentation" activities – spousal actions that directly impact productivity (and higher productivity positively impacts salary). At higher levels of ability, men benefit more from what we term "direct augmentation" activities – spousal actions that directly impact salary (for example, improving public image). We explore a number of additional outcome variables that may be impacted by marital status and can provide some insight into a fuller picture of the effect of marriage on productivity and salaries. We find evidence that marriage negatively affects the variance of performance for high ability players (that is, players are more stable) and that they are better at extracting their economic rent (smaller gap between marginal revenue product and earnings). In addition, at the team level, ballpark attendance and wins are positively correlated with the fraction of married players. Employers may prefer married players because the stability and leadership they provide lead to overall greater team success that is not necessarily captured by the standard individual productivity measures.

Because few men are professional athletes, it is natural to question whether the results presented in this paper can be generalized beyond the sports industry. Although professional baseball players, and professional athletes in general, are a fairly unique subset of the population, the spotlight that professional athletics places on performance provides, what we put forth, is an *a fortiori* argument. If the relationship between productivity and marriage is fairly weak among this population then we conjecture that it is all the more weak among segments of the population where productivity is harder to gauge. While remarkable, a career in professional athletics shares certain features in common with other occupations. Playing professional baseball requires long hours of practice, intense competition and significant travel. As such, we view our project as providing insight into other similarly demanding professions such as CEOs, partners at law firms, politicians, and other high level corporate executives whose measures of productivity are less straightforward. The wife's accessibility to the husband's work world shares similarities to many of these other professions. We also consider our project to be part of a larger group of papers that use very specific data to analyze basic, yet extremely important labor economics questions. Take, for example, labor supply responses to changes in wages. There have been a number of papers analyzing the labor supply of taxi drivers [Camerer et al. (1997), Farber (2005) and Chou (2000)], stadium vendors [Oettinger (1999)], and bicycle messengers [Fehr and Goette (2007)]. These studies produce results that are convincing in their specific setting and may well be general given sufficient replication in alternative settings. Consequently, we view our project as laying the groundwork for further research, perhaps in other individual sports or demanding professions where more direct productivity measurements are able to be collected by the researcher.

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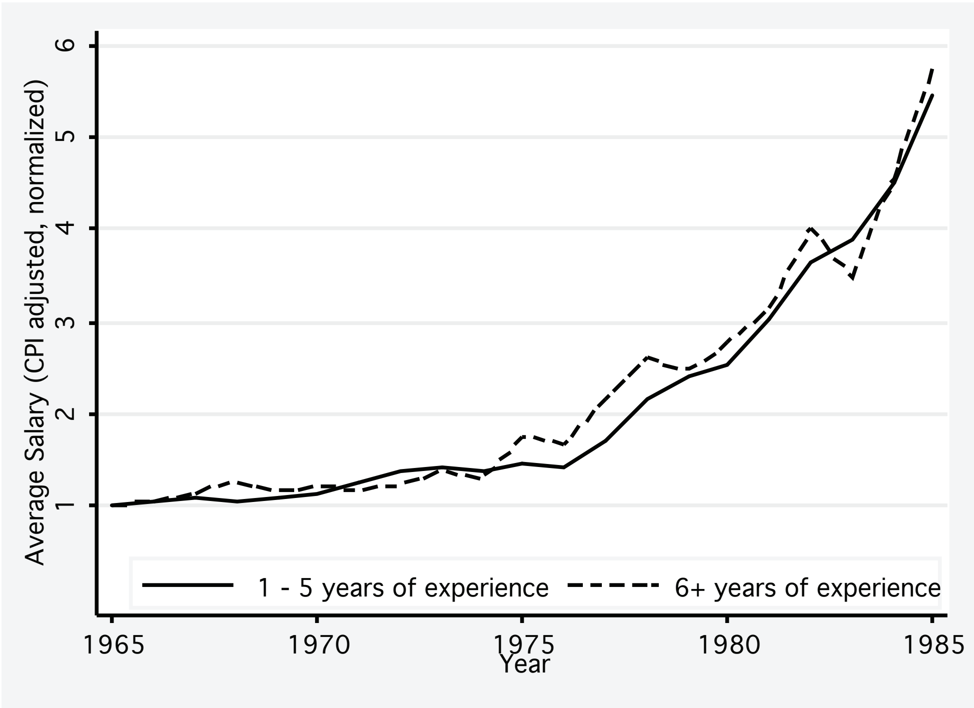
Appendix

Contracts

Contract setting in baseball is fairly complex. Moreover, historical contract data is, to our knowledge, not available in any public forum. We were, nonetheless, able to obtain three years (1994, 1996 and 1997) of “Joint Exhibit 1,” an official document produced annually by Major League Baseball (the sport’s governing authority) and the Major League Baseball Players Association (the players’ union) pursuant to a collective bargaining agreement. The Joint Exhibit 1 contains authoritative, comprehensive descriptions of contract terms for all players active on August 31 of the prior season. These data contain contract information for players with at least three years of experience and cover nearly all players who were under such contracts from the mid-1990s to 2001 (roughly 1470 contracts). There are a number of interesting aspects of this data to note. First, fully 64 percent of all contracts are for one year and 90 percent are for three years or less. From our perspective, this is a positive finding. Short-term contracts allow for salary to respond more flexibly to changes in marital status, productivity and other factors.

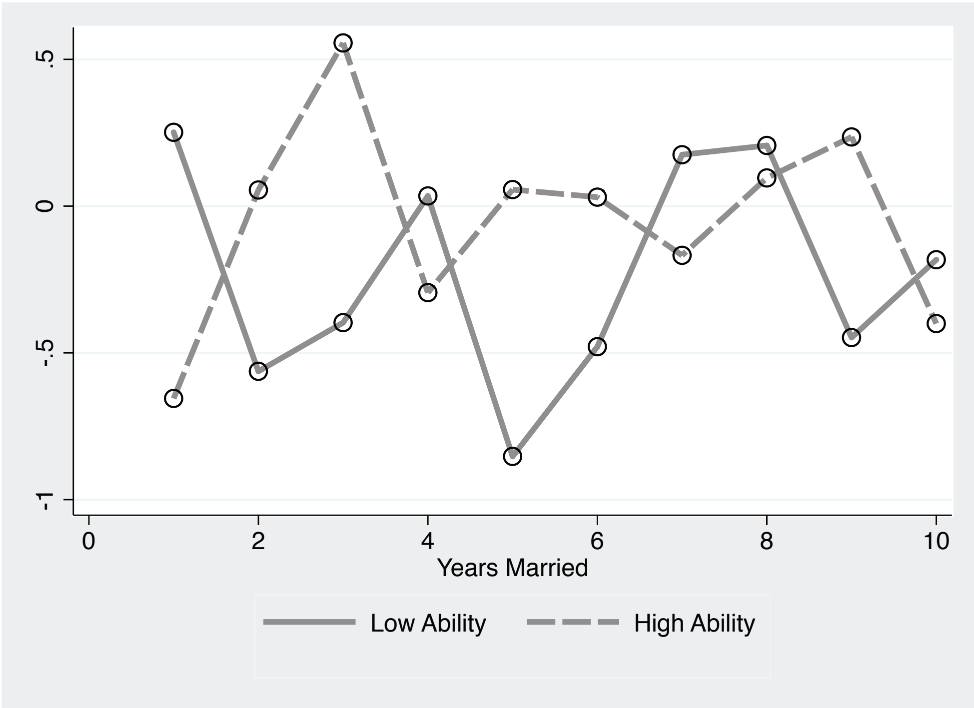
Once merging this contract data to our dataset, we were able to match nearly 750 contract years for 275 players. A second interesting aspect of the data is that once controlling for position and experience, we do not reject the null hypothesis that married and single players have similar contract lengths (p-value of 0.48), or have similar preferences for the makeup of their salaries, where total salary in the first year of the contract is comprised of base salary, signing bonuses and incentive clauses (p-values between .31 - .95). Finally, we attempted to re-estimate our baseline log wage results using this matched data and restricted to observations that were not locked into multi-year contracts (roughly 475 observations), under the hypothesis that salaries would not be flexible after a contract was set. The results from this estimation were inconclusive – the point estimates were consistent with our baseline findings but not statistically significant. Even so, under the assumption that the 1990s are rather representative of other decades (at a minimum post-1975), we are more confident that contracts are not severely hampering flexibility in salary setting in our main database nor do there appear to be any obvious differences in preferences in contract setting between married and single players.

Figure 1: Elimination of the Reserve Clause in 1975



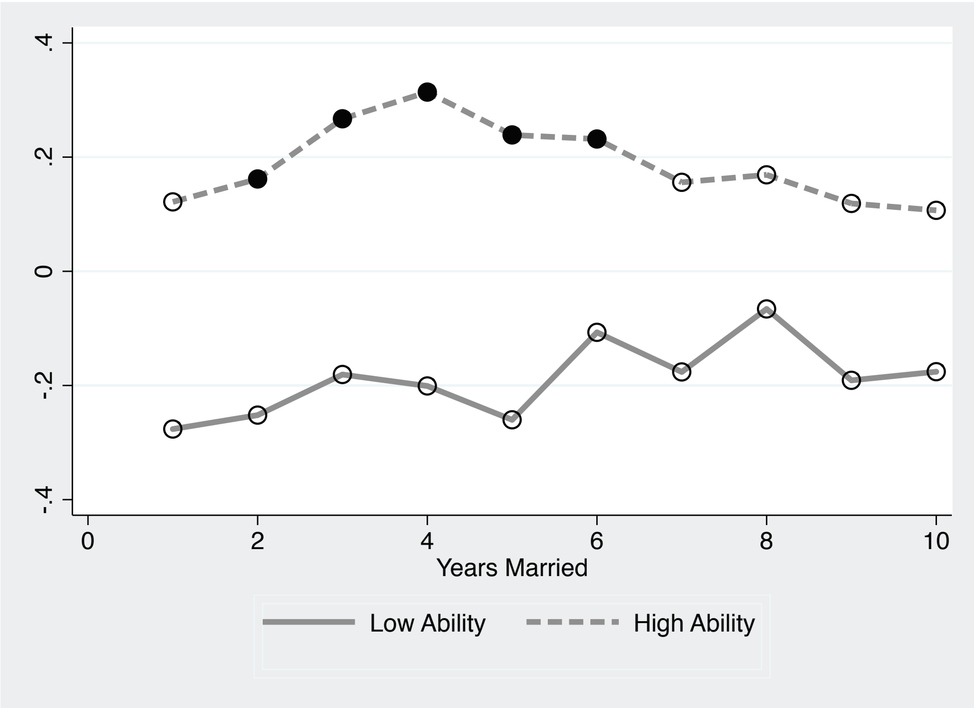
Source: Baseball Archive and other data sources described in Section 5.

Figure 2: Productivity by Years Married (Relative to Years Prior to Marriage)



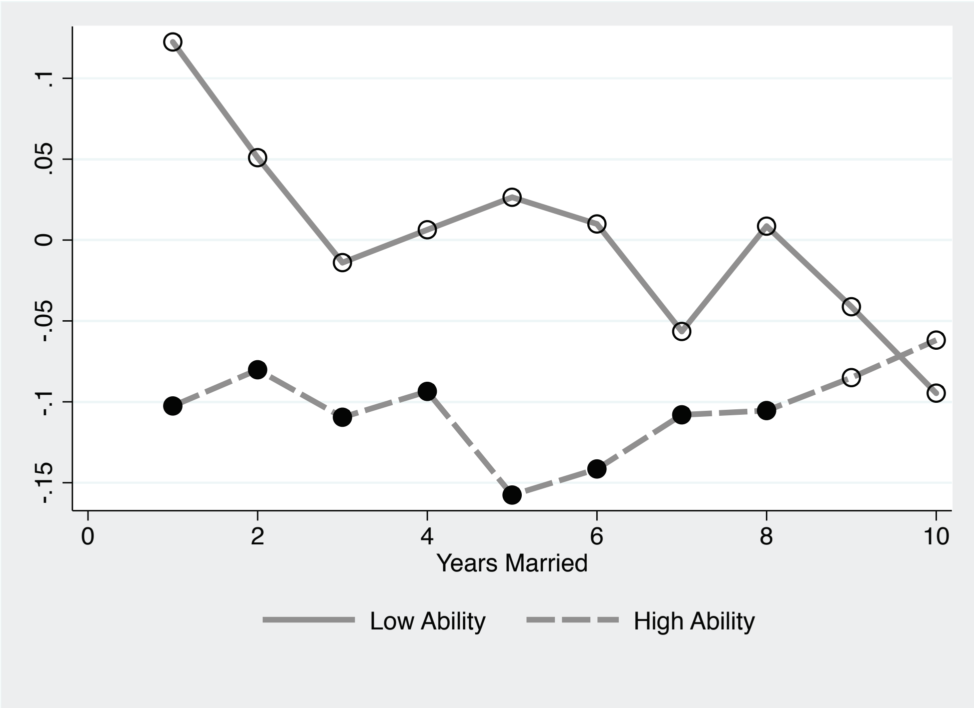
Notes: Sample restricted to players who marry at some point during 1975 - 2007 and to five years prior and ten years after marriage. OLS regression of PEVA on binary indicators for years of marriage, demographics, experience, team-ballpark, position, manager, and year binary indicators. Estimated coefficients are relative to the average productivity in the (up to) five years prior to marriage (the excluded category). ○: not statistically significant at 10% level. ●: statistically significant at at least the 10% level.

Figure 3: Log Salary by Years Married (Relative to Years Prior to Marriage)



Notes: Sample restricted to players who marry at some point during 1975 - 2007 and to five years prior and ten years after marriage. OLS regression of log(salary) on binary indicators for years of marriage, demographics, experience, team-ballpark, position, manager, and year binary indicators. Estimated coefficients are relative to the average log(salary) in the (up to) five years prior to marriage (the excluded category). ○: not statistically significant at 10% level. ●: statistically significant at at least the 10% level.

Figure 4: Performance Stability by Years Married (Relative to Years Prior to Marriage)



Notes: Sample restricted to players who marry at some point during 1975 - 2007 and to five years prior and ten years after marriage. OLS regression of the coefficient of variation of PEVA on binary indicators for years of marriage, demographics, experience, team-ballpark, position, manager, and year binary indicators. Estimated coefficients are relative to the average log(salary) in the (up to) five years prior to marriage (the excluded category). ○: not statistically significant at 10% level. ●: statistically significant at at least the 10% level.

Table 1: Summary Statistics (Individual Level)

Variable	Population	Full Sample	Final Sample	Description
age	24.18(2.84) [9236]	24.19(2.78) [3379]	23.48(1.98) [973]	age
right	0.70(0.46) [8578]	0.69(0.46) [3262]	0.72(0.45) [973]	=1 if the player is right-handed, 0 otherwise
left	0.38(0.49) [8578]	0.40(0.49) [3262]	0.43(0.50) [973]	=1 if the player is left-handed, 0 otherwise
height	71.53(2.37) [7782]	71.63(2.29) [2956]	72.51(2.02) [973]	Height in inches (rookie year)
weight	180.17(24.24) [8727]	181.23(18.21) [3295]	189.59(17.76) [973]	Weight in pounds (rookie year)
white		0.80(0.40) [3374]	0.59(0.49) [973]	=1 if the player is white, 0 otherwise
black		0.13(0.34) [3374]	0.28 [973]	=1 if the player is black, 0 otherwise
hispanic		0.10(0.30) [3374]	0.21(0.41) [973]	=1 if the player is hispanic, 0 otherwise
otherrace		0.01(0.07) [3374]	0.01 [973]	=1 if the player is other race, 0 otherwise
married		0.69(0.46) [19,294]	0.75(0.43) [5849]	=1 if the player is married, 0 otherwise
yearsmar		4.30(6.05) [14,256]	5.76(4.88) [3766]	Number of years married
salary		457.43(1036.66) [13718]	967.48(1439.33) [5486]	Yearly Salary ($000s, adjusted for inflation)
BA	0.241(0.089) [48960]	0.249(.072) [22510]	0.264(0.035) [5907]	Batting Average
OPS	0.651(0.229) [46728]	0.674(0.189) [21779]	0.734(0.115) [5907]	On-base plus slugging
WAR	0.846(1.792) [45961]	0.986(1.877) [22052]	1.43(2.05) [5754]	Wins Above Replacement
$PEVA$	4.001(5.450) [50,363]	4.635(5.717) [22,388]	6.13(5.92) [5882]	Performance Evaluation Value
G	72.88(52.26) [49,356]	83.40(50.09) [22,576]	110.68(36.15) [5907]	Number of games played
PA	270.53(229.43) [44,774]	312.26(225.10) [21,845]	411.82(185.57) [5907]	Plate Appearances
experience	5.51(4.40) [49,357]	5.72(4.21)) [22,576]	7.31(4.12) [5907]	Years in MLB
year	1954(38) [49,357]	1957(36) [22,576]	1991(9) [5907]	Year
position				Fielding position

Notes: All summary statistics are limited to batters only. Population and full sample 1871-2007. Final sample 1975-2007. Standard Deviations in parentheses, number of observations in brackets. Fielding positions include first baseman, second baseman, third baseman, catcher, center field, left field, right field, shortstop. Also includes designated hitter and outfielder. Wage are limited to 1905 - 2007 due to data availability.

Source: Multiple sources, see text.

Table 2: The Effect of Marital Status on Productivity (1975 - 2007)

		OLS				FE			
		BA	OPS	WAR	PEVA	BA	OPS	WAR	PEVA
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
All Players	$married_{y-1}$	-.001	-.007	-.043	-.379	.002	.003	.053	.278
		(.001)	(.005)	(.093)	(.271)	(.002)	(.005)	(.107)	(.269)
	$cons$	.336	.556	6.684	1.439	.565	1.923	18.020	69.709
		(.057)***	(.172)***	(3.374)**	(8.913)	(.097)***	(.336)***	(5.753)***	(17.189)***
	Obs	5907	5907	5907	5907	5754	5882	5754	5882
	R^2	.192	.359	.275	.363	.506	.631	.588	.642
Low Ability	$married_{y-1}$	.006	.011	.363	.816	.008	.008	.299	1.203
		(.004)	(.010)	(.165)**	(.398)**	(.006)	(.014)	(.228)	(.516)**
	$cons$	.189	.297	-8.418	-27.906	.500	1.485	6.358	27.176
		(.102)*	(.314)	(5.687)	(14.818)*	(.211)**	(.570)***	(8.031)	(22.201)
	Obs	1063	1063	1039	1056	1063	1063	1039	1056
	R^2	.351	.466	.405	.526	.596	.695	.651	.727
High Ability	$married_{y-1}$	-.002	-.010	-.061	-.513	.001	.003	.026	.005
		(.002)	(.006)	(.118)	(.325)	(.002)	(.006)	(.145)	(.343)
	$cons$	.360	.431	9.905	19.130	.647	2.356	24.338	91.801
		(.075)***	(.215)**	(4.686)**	(12.847)	(.112)***	(.336)***	(6.528)***	(21.270)***
	Obs	3163	3163	3085	3145	3163	3163	3085	3145
	R^2	.232	.416	.335	.389	.538	.663	.62	.65

Notes: Robust standard errors, clustered on player id in parentheses. All models control for team-ballpark, position, manager, and year fixed effects. OLS controls include: age and its square, experience and its square, race dummies, height, weight, left/right handed, lagged games played, and indicators for more than three and more than six years of experience. FE controls include: age and experience squared, lagged games played, and indicators for more than three and more than six years of experience. Sample restricted to observations with at least 100 plate appearances.

*10 percent significance level, **5 percent significance level, ***1 percent significance level.

Table 3: The Effect of Marital Status on Earnings (1975 - 2007)

		OLS		FE	
		(1)	(2)	(3)	(4)
All Players	$married_{y-1}$	-.008	.026	.048	.053
		(.035)	(.029)	(.050)	(.048)
	$PEVA_{y-1}$		.059		.032
			(.003)***		(.003)***
	cons	9.500	10.520	32.298	30.173
	(1.370)***	(1.301)***	(2.784)***	(2.813)***	
	Obs	5486	5459	5486	5459
	R^2	.816	.839	.896	.901
Low Ability	$married_{y-1}$	.015	.000	-.017	-.027
		(.082)	(.077)	(.108)	(.107)
	$PEVA_{y-1}$		.059		.030
			(.009)***		(.010)***
	cons	5.887	6.403	39.716	39.014
		(2.817)**	(2.458)***	(4.136)***	(4.135)***
	Obs	999	991	999	991
	R^2	.881	.893	.94	.942
High Ability	$married_{y-1}$	.016	.053	.139	.150
		(.049)	(.044)	(.062)**	(.060)**
	$PEVA_{y-1}$		.052		.028
			(.004)***		(.004)***
	cons	13.023	13.518	27.305	24.950
		(2.125)***	(1.952)***	(3.952)***	(3.856)***
	Obs	2911	2892	2911	2892
	R^2	.826	.846	.900	.904

Notes: Dependent variable is equal to $log(salary)_y$. Robust standard errors, clustered on player id in parentheses. All models control for team-ballpark, position, manager, and year effects. OLS controls include: age and its square, experience and its square, race dummies, height, weight, left/right handed, lagged games played, and indicators for more than three and more than six years of experience. FE controls include: age and experience squared, lagged games played, and indicators for more than three and more than six years of experience. Sample restricted to observations with at least 100 plate appearances.

*10 percent significance level, **5 percent significance level, ***1 percent significance level.

Table 4: Summary Statistics (Team Level)

Variable	Population	Sample	Description
$AVGMAR$		0.69(0.14) [774]	Average number of married players on the team
$homegame$	0.50(.01) [2136]	0.50(0.01) [774]	Fraction of games played at home
BA	0.262(.018 [2595]	0.262(.011) [774]	Team level batting average (batter productivity)
ERA	3.80(0.78) [2595]	4.11(0.58) [774]	Team level earned run average (pitcher productivity)
$worldseries$	0.05(0.22) [2238]	0.04(0.19) [748]	= 1 if won World Series, 0 otherwise
$divisionwin$	0.18(0.38) [1050]	0.18(0.38) [748]	=1 if Division win, 0 otherwise*
$wins$	0.50(0.10) [2595]	0.50(0.07) [774]	Winning percentage (wins/games played)
$attendance$	16021(10853) [2136]	25212(9251) [774]	Stadium attendance per home game

Notes: Population 1871-2007. Final sample 1975-2007. Standard Deviations in parentheses, number of observations in brackets. *A division in baseball is a sub-group of teams within each league.

Source: Multiple sources, see text.

Table 5: The Effect of Marital Status on Team Level Success

	wins		division win		log(attendance)	
	(1)	(2)	(3)	(4)	(5)	(6)
$AVGMAR_{y-1}$	0.034**	0.028*	0.176	0.215*	0.273**	0.215*
	(0.016)	(0.015)	(0.112)	(0.122)	(0.110)	(0.127)
$home$	0.401**	0.545**	0.306	1.720	-0.476	0.203
	(0.195)	(0.224)	(3.801)	(3.743)	(1.342)	(1.035)
BA	3.520***	3.260***	9.903***	8.564***		
	(0.162)	(0.194)	(1.357)	(2.105)		
ERA	-0.100***	-0.104***	-0.356***	-0.387***		
	(0.003)	(0.005)	(0.042)	(0.057)		
$worldseries_{y-1}$					0.074	0.079*
					(0.048)	(0.041)
$wins_{y-1}$					1.974***	1.592***
					(0.215)	(0.243)
$cons$	-0.245**	-0.226**	-1.565	-1.587	8.995***	9.136***
	(0.098)	(0.111)	(2.002)	(2.092)	(0.725)	(0.596)
Obs	874	874	846	846	774	774
R^2	0.789	0.829	0.430	0.518	0.723	0.851

Notes: The dependent variable in columns 1 - 2 is equal to the winning percentage (wins divided by games), in columns 3 - 4 it is a binary indicator for a division win, and in columns 5 - 6 it is log of ballpark attendance. The variable $avgmar$ is the team level fraction of married players. $home$ is equal to the number of home games divided by total games. $worldseries$ is a binary indicator equal to one if the team was in the world series. BA_t is the team level batting average over all batters. ERA_t is the team level earned runs average over all pitchers. Robust standard errors, in parentheses, are clustered by team-ballpark. All columns control for year and manager effects, even columns also control for team-ballpark fixed effects.

*10 percent significance level, **5 percent significance level, ***1 percent significance level.

Table 6: Robustness Test: Endogenous Attrition

	PEVA						log(salary)					
Experience ≤	4 yrs	6 yrs	8 yrs	12 yrs	16 yrs	20 yrs	4 yrs	6 yrs	8 yrs	12 yrs	16 yrs	20 yrs
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
						All Players						
$married_{y-1}$	0.652	0.217	0.344	0.198	0.227	0.280	0.004	0.038	0.034	0.032	0.031	0.051
	(0.924)	(0.440)	(0.339)	(0.288)	(0.277)	(0.268)	(0.093)	(0.060)	(0.049)	(0.050)	(0.049)	(0.048)
cons	193.537*	202.440***	145.812***	96.776***	86.604***	74.113***	9.799	35.204***	39.248***	40.139***	33.089***	30.692***
	(117.411)	(33.427)	(21.374)	(16.664)	(17.632)	(16.366)	(15.280)	(4.877)	(3.578)	(2.647)	(2.966)	(3.041)
Obs	1,781	2,895	3,869	5,177	5,743	5,890	1,570	2,611	3,525	4,782	5,325	5,467
R^2	0.805	0.753	0.720	0.667	0.645	0.643	0.962	0.940	0.934	0.917	0.906	0.902
						Low Ability						
$married_{y-1}$	1.119	1.484	1.454*	1.230**	1.227**	1.204**	-0.002	0.154	0.100	0.017	-0.023	-0.019
	(1.614)	(1.073)	(0.764)	(0.581)	(0.529)	(0.518)	(0.445)	(0.269)	(0.173)	(0.095)	(0.101)	(0.104)
cons	233.709	200.611*	138.641**	55.444	43.966	30.179	32.054	22.909	45.935***	51.128***	41.172***	43.173***
	(191.782)	(118.853)	(58.182)	(43.662)	(35.047)	(26.033)	(26.152)	(18.447)	(12.156)	(6.770)	(6.330)	(5.128)
Obs	292	498	696	948	1,042	1,055	263	458	645	888	978	990
R^2	0.946	0.900	0.851	0.749	0.731	0.727	0.983	0.966	0.967	0.954	0.944	0.943
						High Ability						
$married_{y-1}$	1.423	0.558	0.403	-0.054	-0.097	-0.025	0.057	0.125**	0.122**	0.142**	0.123**	0.157***
	(1.661)	(0.661)	(0.505)	(0.395)	(0.355)	(0.346)	(0.146)	(0.063)	(0.062)	(0.064)	(0.062)	(0.060)
cons	38.929	208.633***	143.371***	111.806***	97.897***	90.005***	18.595**	36.193***	36.337***	37.574***	29.617***	25.231***
	(66.671)	(51.452)	(30.633)	(21.904)	(21.858)	(21.108)	(8.547)	(6.976)	(4.715)	(3.565)	(3.903)	(3.852)
Obs	957	1,528	2,029	2,706	3,032	3,140	831	1,362	1,828	2,475	2,785	2,890
R^2	0.829	0.772	0.731	0.677	0.652	0.650	0.967	0.952	0.943	0.924	0.911	0.905

Notes: All models control for individual, team-ballpark, position, manager, and year fixed effects. Robust standard errors clustered on player id in parentheses. Other controls include: age and experience squared, lagged games played, and indicators for more than three and more than six years of experience. Sample restricted to observations with at least 100 plate appearances. *10 percent significance level, **5 percent significance level, ***1 percent significance level.

Table 7: Robustness Test: Dynamic Selection

	All Players			Low Ability			High Ability		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$log(salary)_{y-1}$	.018			.067			.032		
	(.029)			(.108)			(.043)		
$log(salary)_{y-2}$	-.022			.177			-.025		
	(.029)			(.119)			(.047)		
$YearThree_{y-1}$		.027			-.106			.038	
		(.032)			(.146)			(.057)	
$YearSix_{y-1}$		.047			.114			.048	
		(.033)			(.127)			(.066)	
$YearThree_{y-2}$		.052			-.016			.068	
		(.040)			(.117)			(.056)	
$YearSix_{y-2}$		.031			.099			.089	
		(.040)			(.139)			(.071)	
$PEVA_{y-1}$			.000			.009			.000
			(.003)			(.012)			(.005)
$PEVA_{y-2}$			-.001			.015			.002
			(.002)			(.015)			(.004)
cons	.016	.115	.541	.419	-1.573	.489	-.433	-.324	-1.448
	(.975)	(.967)	(1.007)	(7.936)	(7.347)	(7.789)	(1.879)	(1.863)	(1.863)
Obs	1779	1779	1770	335	335	335	894	894	889
R^2	.261	.262	.262	.779	.764	.763	.384	.387	.383

Notes: Dependent variable is equal to one if year of marriage occurs in year y, zero otherwise. All models control for team-ballpark, position, manager, and year effects and are estimated by OLS with robust standard errors, clustered on player id in parentheses. OLS controls include: age and its square, experience and its square, race dummies, height, weight, left/right handed, and lagged games played.

*10 percent significance level, **5 percent significance level, ***1 percent significance level.

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