

Career Interruption and the Productivity of Superstars: Evidence from Major League Baseball During the Vietnam War Era

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Abstract

Do superstars receive dramatically larger incomes because they are dramatically more productive or simply because luck has placed them at the top? Using data on the careers and productivity of Major League Baseball players subject to the Vietnam War draft, we find that birthdates randomly drawn in the draft produce 19% fewer players who eventually make the major leagues. Players born on drafted birthdates who do make it to Major League Baseball produce 29% fewer wins than those born on undrafted days, a gap that is largest for the most productive players and persists as players age. We conclude that the identities of the winners in superstar labor markets can be sensitive to random shocks to early career experience precisely because such shocks hurt productivity.

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1. Introduction

Inequality has increased dramatically in the United States, particularly at the very top of the income distribution. The fraction of total income going to the top 1% of income earners has doubled since 1980 (Piketty and Saez, 2003). Some observers credit this change to the manner in which globalization and changes in technology have enabled very productive superstars to reach a dramatically larger audience (Mankiw, 2013). Others argue that the dramatic rise in incomes at the top should instead be credited to rent-seeking (Bivens and Mishel, 2013). Such debate revolves around a central question: are superstars paid dramatically more than other people because they are dramatically more productive or are they paid more because they successfully take advantage of circumstances born out of luck or privilege? This question proves difficult to answer because the productivity of superstars can rarely be observed directly. In the present study, we solve this problem by studying the particular case of Major League Baseball players during the Vietnam War era. We find that membership in the major leagues is highly contingent on early career shocks. Men born on dates randomly selected to be eligible for military service are much less likely to arrive in the major leagues. However, underrepresentation occurs because being drafted makes players less productive. Players born on drafted dates who make the major leagues are much less productive than undrafted men throughout their careers, and such effects are strongest at the very top of the productivity distribution. Thus, drafted men become underrepresented among the superstars of baseball precisely because they perform worse as players. Membership among the superstars is determined by productivity but at the same time is heavily contingent on random shocks because productivity responds sensitively to early career experience.

We can demonstrate these results because we can measure productivity for each Major League Baseball (MLB) player using a widely accepted measure, the number of wins above replacement produced by each player. We combine baseball performance data with random variation in draft-eligibility from the Vietnam War draft lottery (Angrist, 1990) to test how this exogenous career interruption affects career success. We find that the average drafted birthdate generates players producing 45% fewer wins than the average undrafted day. Drafted days produce fewer wins partially because they generate fewer major league players. A total of 27 players, just surpassing one full team's roster, are missing from the drafted days. Total production on drafted days also falls because players born on drafted days are 29% less productive over the course of their careers conditional on playing in MLB. Productivity per season, rather than number of seasons played, drives most of this change. Interestingly, drafted players also never catch up with undrafted players, continuing in underrepresentation and lower productivity throughout their entire careers. The drop in productivity matters most for superstars at the top of the distribution. One third of all birthdates were randomly selected to be drafted. However, none of the 10 most productive players in our sample were born on drafted dates, and none of the 6 players in our sample inducted into the Hall of Fame were born on drafted dates. The effect slowly fades as one moves down the productivity distribution: 4 of the top 20, 6 of the top 30, 15 of the top 50, and 30 of the top 100 players were born on drafted days. Overall, being drafted generates dramatic and persistent reductions in employment and productivity of these superstars, supporting the hypothesis that being drafted has particularly negative effects at the top of the income distribution.

Interruptions to early career accumulation of skills and experience, rather than the direct effect of military service, drive at least some of our results. Four pieces of evidence support this

interpretation. First, large reductions in productivity conditional on playing in MLB seem inconsistent with mortality or war-related injuries driving the results. Second, being drafted only increased the probability of military service by 16% (Angrist et. al. 2011), which cannot fully account for the dramatic underrepresentation of draft-eligible birthdays in MLB. Third, we observe the greatest underrepresentation of drafted birthdates in baseball among players who attended 2-year colleges. Military service deferrals shielded players at such schools from military service only partially ex-ante but completely ex-post. Thus, the direct effect of military service cannot explain their underrepresentation. Instead, draft-eligibility appears to have induced a sub-optimal rearrangement of early career training and schooling, interrupting natural development of players and leading to lower productivity. Fourth, we do not observe underrepresentation of drafted birthdates in the National Football League, a similar profession with a different early-career training structure. Altogether, being drafted interrupted early career training of potential MLB players, either directly via military service or indirectly by influencing schooling choices, leading to the underrepresentation and lower productivity that we observe.

While our results pertain to professional baseball, they have more general implications in three important strands of the existing literature. First, we contribute to understanding of labor markets for very high income earners. A well-established theory literature explores tournament (Rosen, 1986; Lazear and Rosen, 1981) and superstar (Rosen, 1981) labor markets. A sizable empirical literature exists, but superstar productivity generally proves difficult to measure. Some studies measure CEO performance using firm performance, but this combines productivity with luck (Bertrand and Mullainathan, 2001). We thus follow the argument of Kahn (2000) and focus on the labor market for professional athletes as a context in which we can measure productivity and use this data to answer otherwise unanswerable questions. While necessarily narrow,

focusing on careers in baseball provides a useful analogue to other superstar career paths, such as finance, in which a strict career track quickly weeds out most potential candidates and few make it to the top. We use finance as an example of a labor market with a tournament structure not unlike professional baseball. While we respect the uniqueness of the labor market for professional baseball players, its similarities to other superstar professions, finance for example, make it worthy of careful exploration. The tradeoff facing a new minor league baseball player, high returns to reaching the top but a very low probability of success, does not differ significantly from that of an ambitious person starting in finance, aiming to become a Goldman Sachs partner (see discussion below). Thus, when we find that status as a major league baseball player hinges on random early-career events because these events affect productivity, this result has some bearing on superstar labor markets more generally. Because productivity responds to random events, the very tendency of tournament labor markets to sift for the most productive workers also makes the identity of the winners subject to considerable randomness.

Such observations also relate to the literature on career interruptions more generally. Our results provide support for the idea that success in superstar professions generally requires uninterrupted career progress. Some caution should be taken in applying results of conscription of male professional athletes to, for example, the labor market implications of female fertility. However, our results do relate to the literature on childbirth and career interruptions for women. A large empirical literature debates whether career interruption, fertility, and childbirth can account for a significant portion of the gender gaps in the labor market (Albrecht et al. 1999; Miller, 2011; Bailey, 2006; Wilde, et al., 2010). Bertrand, et. al. (2010) argues that family-related career interruptions drive most of the gender earnings gap for a sample of superstars graduating from a prestigious MBA program. We contribute to this literature by showing that

continuous, early-career experience affects productivity in superstar professions. Short-term interruptions to the required sequence of training and experience may permanently remove one from consideration because absences lead to lower productivity. Even in professional sports, an arena in which many argue that natural talent dominates accumulated experience, we find that early career shocks can lead to permanent gaps in productivity.

Finally, we contribute to the literature studying military conscription. The effect of draft-eligibility on earnings has been well-established in the literature (Angrist, 1990; Angrist et. al., 2011; Siminski, 2013; Bauer, et al., 2009; Card and Cardoso, 2011). The literature has also demonstrated that draft service may more negatively affect more advantaged individuals. Angrist (1990) finds that the draft lowers earnings for whites but not for non-whites. Similar to our study, Frank (2012) focuses on one superstar labor market, finding that drafted birthdates are underrepresented among CEOs. However, such effects could arrive via many possible mechanisms. Being drafted could lower productivity, but it also could alter preferences of the worker, lowering the probability of working in risky professions with high compensating differentials. Labor market discrimination against veterans could drive lower earnings. However, previous studies have difficult parsing these explanations due to data constraints. We thus focus on professional baseball because we can observe employment and productivity directly, demonstrating that being drafted lowers productivity. To our knowledge, we provide the first such evidence that differences in productivity can drive the labor market effects of being drafted. Additionally, we show that being drafted has the most negative effect at the very top of the productivity distribution. Thus, we add to the literature on the effects of conscription, providing new evidence on the role of productivity and convincing evidence regarding how and why conscription particularly affects those in superstar professions.

The remainder of our paper provides the study in greater detail. Section 2 provides important background information including placing professional baseball in the context of superstar professions more generally, a discussion of the key features of the Vietnam draft, and further detail on the existing literature. Section 3 describes the data and our identification strategy. Section 4 provides the results, and we conclude in Section 5.

2. Background and Existing Literature

2.1. Baseball Players among Other Superstars

Professional baseball exhibits the features of a tournament labor market. It features a highly structured training process progressing in stages. Players begin on amateur teams often affiliated with high schools and colleges and then participate in a formal draft that assigns a particular team the rights to a player. Players then compete in several lower levels of professional baseball, the minor leagues. Successful players ultimately graduate to Major League Baseball; however, very few make it to this point. Table 1 draws on the Lahman Baseball Database (see below) and draft data from Baseball-Reference.com. A total of 929 players were selected in the 1970 first-year player draft of professional baseball. Of these, only 146 eventually made it to MLB. Less than 2% achieved the stardom of being named to MLB's All-Star game and only 5 players were consistent stars, reaching the All-Star game more than once.

As players move up the ladder, pay increases dramatically. Representative historical statistics on pay for minor league players are difficult to obtain, but similar facts exist for the present day. Current players starting off in minor league professional baseball receive \$3,000 to \$7,500 for a 5 month season. Those promoted to the highest minor league level, AAA, receive salaries up to six figures. The average major league player in 2010 received a salary of \$3.3

million, and the highest paid player (Alex Rodriguez) received \$33 million that year. Thus, the brightest superstars can receive 10 times the salary of the average major league player and 1,000 times the salary of the typical minor league player. A relatively rigid structure that progresses from a large number of low-pay competitors to a small number of very well-compensated players makes professional baseball a classic case of a tournament labor market.

Another important feature of professional athletics is that players reach their peak early in life and tend to have short careers. Of course, the importance of physical ability tends to drive this trend. Of those players born in 1952 who made it to MLB, the typical player debuted in MLB at age 24 and played his final game between ages 29 and 30. Given that roughly half of players in our sample attended college, a typical career then involves becoming a professional at age 20, either making it to MLB or dropping out by age 24, and then playing for 5 or 6 years at the top of the game. The major league careers of professional baseball players tend to be short, and the players themselves tend to be young.

The external validity of our results depends on whether other superstar professions tend to share the tournament structure and short career duration evident in Major League Baseball. If this is true, then the results of the present paper will have useful interpretive value outside of the labor market for professional athletes. As an example, we consider careers in finance. Finance has drawn significant policy interest recently as a profession drawing the most debate on whether high incomes reflect productivity or rent-seeking. Bakija, et. al. (2012) provide evidence that finance represents an increasingly important industry among high-income earners. They examine professions listed on the tax returns of the top 1% of income earners and find that the share of financial professionals nearly doubled from 1979 to 2005 and that finance now composes the third largest professional group in the 1% (behind executives and

medicine). Representative data on career paths in finance are not generally available. However, simple descriptive facts match up closely with professional baseball, indicating a rigid tournament structure and short careers at the top. Top investment banks tend to recruit analysts and associates directly from top undergraduate and MBA programs. Table 1 also shows information for one top investment bank, Goldman Sachs, obtained from its annual reports and media descriptions. In its 2012 annual report, Goldman Sachs reported 43,000 candidates applied for entry-level analyst positions with only 4% receiving offers. Of those receiving offers, 80% accepted (Goldman Sachs, 2013). The small percentage who are hired then proceed through a well-established structure from analyst, to associate, vice president, director, etc. Goldman Sachs employs 32,400 people but only 467 have made it to the top of the ladder as a partner. Out of all Goldman Sachs employees, 1.4% have made it to partner status, slightly worse odds than those that a new minor league baseball player has of eventually making the All-Star team. Pay also rises dramatically in finance. Entry level analysts at Goldman Sachs receive salaries not that different from a AAA minor league baseball player, partners receive compensation (including bonuses) on par with the average MLB player, and the top executives of a bank like Goldman Sachs can earn bonuses exceeding the top baseball players. Pay and the probability of reaching the top of the pyramid in finance look very similar to professional baseball.

Careers at the top of finance also tend to be short and dominated by younger workers. People have made partner at Goldman Sachs in their late twenties and early thirties (The Economic Times, 2014), though mid-to-late thirties is more common. Once at the top, these individuals tend to only stay on the job for 5 to 8 years (Rappaport and McGinty, 2012). Thus, a typical partner would start with a low-level position after college at age 22, take 10-12 years to

work to partner status, remain in that position for 5-8 years, and retire or move on by her early forties. More representative data on the financial industry shows a relatively young workforce as well. According to 5-Year estimates from the 2006-2010 American Community Survey, 41% of financial managers in the state of New York are under 40 years old and 73% are under 50.

While this lengthens out the career timeline somewhat from professional baseball, the two do not differ dramatically. Like baseball, finance is a more of a young person's game than the typical profession.

If the career path of a professional athlete differs dramatically from other superstar professions, then empirical evidence regarding career interruptions for baseball players would be less useful when considering superstar labor markets more generally. However, the striking features of Major League Baseball make it similar to rather than different from other superstar labor markets of policy interest. In particular, career progress in finance tends to involve a tradeoff between huge rewards for those few who make it to the top but high attrition on the way up the ladder. The tournament proceeds quickly in both finance and baseball, leading to careers that advance rapidly with short stays at the top. Of course baseball differs from other fields in some manners. It places heavy emphasis on physical rather than mental ability. However, career progression in baseball appears similar to other key superstar professions. Because of the similarity in training and tournament structure, analysis of early career interruptions in baseball provides a useful window into superstar labor markets more generally.

Of course, the particular skills required to be a productive as a baseball player differ from those required to succeed as an investment banker, business executive, or orthopedic surgeon. Each area has its own very unique skills. However, in the present study we focus on whether disruptions to early career training and experience lead to a persistent reduction in the

accumulation of such specific human capital. What matters for transferring our results to other contexts is whether early career experience matters more for human capital formation in professional baseball than in other superstar professions. This seems unlikely. Given the necessity of natural talent in sports versus experience and formal training in other superstar professions, one would arguably expect early career experience to matter less (or not at all) in professional baseball. In professional sports more than in other fields, productivity depends on in-born skills which cannot be changed by experience. Furthermore, employers can measure productivity objectively, diminishing the likelihood that the early career experience carries important signaling value. Thus, the nature of the particular skills required by professional sports would, if anything, lead us to underestimate the importance of early career experience in superstar labor markets more generally.

2.2. The Vietnam Draft Lottery and Labor Market Outcomes

The effect of veteran service on post-service outcomes has been studied in many contexts. The seminal work in this body of literature, Angrist (1990), uses Vietnam War draft-eligibility as an instrument for military service. Angrist uses income data from the Social Security Administration to estimate the effect of military service on future earnings and finds that in the early 1980s white veterans earned 15% less on average than nonveterans. In follow-ups to this study, Angrist and Chen (2011) and Angrist et. al. (2011) uses expanded data to document that by the early 1990s the income gap for white veterans had closed as the returns to greater levels of education to veterans accrued. Several other studies using a similar approach have produced comparable results in other countries with compulsory military service. Imbens and Van Der Klaauw (1995) examine the effects of compulsory military service in the Netherlands. Ten years after military service, they find that drafted individuals earned 5% less on

average than non-drafted members of their same cohort. Siminski (2013) undertakes similar analysis among Vietnam draftees in Australia. He finds a negative impact of military service on employment. Inconsistent with the other literature, he finds that the gap has widened over time likely due to veteran disability payments which have disincentivized employment among this group. Similar analysis on the German draft in the 1950s finds no long term earnings differences between veterans and nonveterans (Bauer et al. 2009). These papers are similar in that they draw heavily on the Angrist (1990) framework and look at outcomes such as employment and earnings for the entire cohorts that they study.

Our study fits within a branch of this literature that examines whether conscription has different effects across the income distribution. The original Angrist (1990) study finds no effect of draft-eligibility for nonwhites, suggesting that the negative effects of military service are concentrated among those with the best ex-ante labor market prospects. Card and Cardoso (2011) examine the Portuguese draft during a time of peace and find a positive effect on wages for drafted individuals with little education and almost no effect for the more educated. Frank (2012) uses the standard draft-eligibility instrument but examines its effect on a sample of corporate executives. This analysis bears greatest similarity to the present paper in that it selects a specific, highly-skilled labor market for analysis. Frank (2012) finds that drafted individuals are underrepresented in his sample of top corporate executives. Additionally, he finds evidence that draft status explains variation in earnings and age of entry into top executive positions. The first step of our paper is to replicate this analysis, showing that baseball players are also underrepresented, but our main contribution is on two further dimensions. First and most importantly, we can directly observe productivity, which allows us to parse not only if but also why being drafted affects potential superstars' labor market outcomes. Second, we focus on a profession in

which birth dates and employment are universally observable. Frank (2012) faces very high attrition rates in observing birth dates and thus draft status of CEOs. While he demonstrates that CEO's with and without matched birth dates appear similar on a small number of observable variables, very low match rates raise the concern that unobservable characteristics drive differential reporting of birthdates between those drafted and those not drafted. Thus, we start by confirming similar underrepresentation of drafted birth dates among CEOs and major league baseball players despite potential differences in how these labor markets function and technical issues regarding matching birth dates. We then move to our main focus, analyzing the effect of the draft on productivity of superstars.

2.3. The Vietnam Draft Lottery as Career Interruption

Being selected in the Vietnam draft lottery represents a career interruption more generally rather than simply an induction into military service. During the timeframe on which we focus, being selected for the draft only increased the probability of being drafted by 16 percent (Angrist et. al. 2011) because some undrafted men volunteered while many drafted men did not serve due to carve outs for schooling. Angrist and Krueger (1992) find higher average schooling among those with low draft numbers and Card and Lemieux (2001) argue that the Vietnam draft increased college enrollment by 4-6 percentage points. Draft deferments for married fathers may also have affected fertility (Kutinova, 2009) though such deferments had been eliminated during our sample period. Thus, being drafted sometimes interrupted careers via military service but also sometimes by altering education and fertility decisions with important career implications. Given the magnitude and pattern of the effects we observe below, we will focus on interpreting our results as resulting from a general career interruption rather than military service per se.

Thus, we relate the present study to the larger literature on career interruptions. The majority of this literature focuses on whether bearing children has a negative effect on women's labor market outcomes. The early literature demonstrates that career interruptions negatively correlate with earnings through many potential mechanisms including depreciation of human capital or signaling (Albrecht et al. 1999). However, the evidence in the literature is now mixed on the importance of this effect. Miller (2011) uses an instrumental variable analysis and finds that motherhood decreases both the level and slope of a mother's wage profile, and that older women are penalized less for motherhood than younger women. Kunze (2002) looks at the effect on earnings of different types of career interruptions in Germany and finds significant negative effects for women after maternity leave. Similarly, Bailey (2006) demonstrates that availability of contraception increases female labor market participation. On the other hand, Gupta and Smith (2002) find that children do not have a negative effect on a mother's wages in a sample of women in Denmark.

The present study has greatest bearing on whether such career interruptions matter most for those in superstar professions. The current literature on career interruptions for women debates whether such interruptions matter more or less for high-skilled women. Wilde, et al. (2010) argues that postponing childbirth provides the greatest benefits for high-skill women. On the other hand, Amuedo-Dorantes and Kimmel (2004) finds among college-educated women that those becoming mothers actually experience a wage boost. While existing studies can debate the effects of career interruptions for high-skill women, very few studies can test this hypothesis focusing on the very top, on superstars. In one exception, Bertrand, et. al. (2010) follow a sample of graduates from a top US MBA program, finding that a wide earnings gap opens between men and women mainly because women work fewer hours and have less continuous

experience. Interestingly, they find that pay responds to career interruptions non-linearly, with the existence of any career interruption more important than the number of such interruptions. In general, though, research in this area is limited with evidence lacking regarding why career interruptions matter in superstar professions. By using comprehensive data on one profession combined with observable productivity, we can better parse why career interruptions matter. The circumstances of modern female CEOs and male professional baseball players during the Vietnam Era differ in obvious ways. However, both face the prospect that early career disruptions could derail their progress in superstar professions. Thus, our present study provides useful insight into how career disruptions can affect workers in rigidly structured superstar professions.

3. Data and Empirical Strategy

3.1. Vietnam Draft

We follow Angrist (1990) and make use of data from the United States compulsory military service during the Vietnam War. From 1970 to 1975, the United States held random drawings to determine eligibility for compulsory military service. The first such lottery in 1970 covered 19-26 year-old men at the time of the draft. Only 19-20 year-olds were drafted in 1971 and 1973 to prevent subjecting men to draft risk more than once. Draft lotteries were also held in from 1973 to 1975 but no men were drafted. A Random Sequence Number (RSN) was assigned to each date of birth for each draft year, and individuals with low numbers were at risk of conscription. Being selected for a low number could matter for labor market outcomes through many channels including conscription but also by changing incentives to volunteer or attend school. Additionally, many individuals born on drafted days ultimately did not serve due to various carve outs. We will follow Angrist (1990) by matching men to draft numbers

according to their birthdate's RSN in the draft year in which they turn 19 years of age and assigning an individual as "drafted" if he has a draft number below 195 in 1970, 125 in 1971, 95 in 1972, and 95 in 1973. While no one was actually drafted in 1973, low draft numbers in 1973 still interrupted careers by altering school and volunteering choices. Thus, we follow Angrist (1990) in assigning a cutoff of 95 in 1973. We will henceforth refer to individuals and birthdates with RSNs below these cutoffs as "drafted."

3.2. Major League Baseball – Birthdays

We use data covering the universe of Major League Baseball (MLB) players in Lahman (2014). This database includes, among other things, exact birthdays for every person who has played Major League Baseball. For a robustness check we also use birthday data on National Football League players obtained from pro-football-reference.com. As in Angrist (1990) we limit our attention to individuals born between 1950 and 1953, matching each player to the draft year in which they reached 19 years of age. We include players of all nationalities as over 90% of MLB players came from the United States and immigrants are not exempt from US selective service. Using exact birth dates, we match each individual to an RSN for the appropriate draft year and thus classify each player as having been drafted or not. Using this information, we can relate draft status to any player's baseball statistics. Similarly, we can also calculate the eventual number of MLB players born on any given birthdate and relate this to the birthdate's associated draft RSN.

3.3. Major League Baseball – Productivity

One main advantage of studying professional athletes is that we can observe and use a widely accepted productivity measure. We measure productivity using Wins Above

Replacement (WAR) from Baseball Reference (2014).² WAR has four components: batting, base running, defense, and pitching. Batting productivity is measured using a linear combination of offensive outcomes (e.g. home runs). The weights in the linear combination depend on the expected number of runs caused by the event, accounting for runs scored and changes in the state of the world (runners on base, number of outs) as in a simple dynamic programming framework. In this way, one can calculate the number of runs caused by a player's batting over the course of a season. Base running similarly measures how many runs a player adds by stealing bases or taking additional bases on a teammate's hit. Data on whether a player is more likely to field a ball or throw a runner out can be used to measure defensive productivity. Finally, pitching productivity can be measured rather directly using runs allowed data.

WAR then provides a comprehensive measure of a player's productivity by combining batting, base running, defense, and pitching into one measure. Since each component is measured in runs, they can simply be added up to obtain the total numbers of runs caused by a player. One difficulty in simple addition is that a player would not receive credit for being in a difficult defensive position (e.g. shortstop). To account for this, WAR adds a positional adjustment to a player depending on his defensive position. Players in more difficult positions are credited with more such runs. With a player's total number of runs (batting, running, fielding, pitching, and positional adjustment), WAR converts runs to wins according to the empirical relationship between the two (roughly 10 runs to one win). Finally, as the WAR acronym implies, player productivity is measured relative to "replacement level." To account for the opportunity cost of putting a player on the roster or in the game, WAR compares a player's total runs to replacement players who are assumed to be abundant. In the end, we have a

² There are different WAR measures produced by different analysts, though all have the same basic framework. All of our references to calculations refer to the version produced by Baseball Reference.

productivity measure that is widely used, accurate, comparable across players, and measures all main aspects of the job.

While developed recently, the Wins Above Replacement measure also strongly correlates with more “traditional” measures of player productivity based on expert opinion such as participation in the All-Star game and membership in the Hall of Fame. Fans, players, and coaches vote for the participants in the All-Star game, while members of the Baseball Writers Association of America select inductees into the Baseball Hall of Fame. Using data from the Lahman Baseball Database, Figure 1 shows the relationship between Hall of Fame membership and career wins above replacement. Players accumulating less than 50 WAR almost never make the hall of fame. The probability of being voted in then increases through about 100 WAR. Above this cutoff of measured productivity, all players have made the hall of fame. Figure 2 shows a similar positive relationship between All-Star game appearances and career wins above replacement. We will use Wins Above Replacement as our measure of productivity, and this measure correlates with more traditional measures when evaluating the productivity of baseball players’ entire careers.

3.4. Empirical Strategy

Our analysis will compare birthdays that were drafted versus those that were not drafted for compulsory service during the Vietnam War. We build our analysis on two main facts. First, people born on drafted birthdates were at greater risk of compulsory military service. Angrist (1990) and others confirm this fact empirically. While such service was not certain, the probability of military service was higher for those born on dates selected in the draft. All of our analysis will compare drafted and undrafted days, measuring the effect of being drafted rather than the effect of military service itself. Second, the days drafted were chosen at random each

year. Differences in career outcomes between those participating in military service and those not (or more generally between those experiencing career interruptions those not) may reflect not only the causal effect of the interruption but also bias from ex-ante differences between the two groups. Because the Vietnam draft randomly assigned draft status³ we avoid this source of bias. Thus, if being drafted has no long-run effects, then the number and quality of Major League Baseball players born on a drafted day should not differ from that of an undrafted day. Any difference must be due to the effect of being drafted because days were chosen at random. If we should observe either that fewer players born on drafted days reach the major league or that players who do make it have lower productivity, then we would conclude that being drafted lowers the productivity of potential players.

Figure 3 displays the basic outline of our empirical strategy graphically. The blue bars show how many players we would expect to have been born on drafted days if being drafted had no effect. For birth year 1950, 53.3% of all birthdays were drawn for compulsory service. These days were chosen at random. Thus, we would expect 53.3% of all MLB players born in 1950 to have been born on these days if the draft has no effect on player productivity.⁴ However, the red bar shows that only 50.4% of MLB players born in 1950 were born on drafted days, 2.9% lower than expected. Similar differences can be observed in each draft year. Aggregating over all four years, the percentage of players born on drafted days is 4.5% lower than would be expected. Major League Baseball appears to be missing players born on drafted days. Our analysis below will formalize this analysis statistically and extend it to more outcomes.

³ Randomization is conditional on year of birth and potentially also month of birth. See Fienberg (1971) and Rosenblatt and Filliben (1971). Thus, we will also present results with year and month fixed effects.

⁴ Some days may have higher birth rates than others (e.g. due to seasonal differences in fertility). But random selection of drafted dates ensures that the drafted and undrafted days have the same average birth rates. Thus, the proportion of people born on drafted days equals the proportion of days drafted.

While the use of the Vietnam draft as a natural experiment has been well-established, the third, green bar in Figure 3 provides some justification in the context of Major League Baseball that there is nothing systematically different about the days chosen by the draft. The green bar for each draft year calculates the percentage of players born exactly four years after drafted days. Since there were no drafts 4 years later, the particular days drafted should not be different from other days and the percentage of players born on such a day should simply correspond to the percentage of days drafted. For example, the 1954 green bar demonstrates that 54.0% of MLB players born in 1954 were born on birthdays corresponding to 1950 drafted days. This bears close similarity to the expected value of 53.3%. Pooling over all four years, the younger cohorts who were not subject to the draft do not show the same tendency to be dramatically underrepresented. The draft provides a valid experiment in which any difference observed regarding players born on drafted versus undrafted days can be attributed to the effect of the draft itself.

4. Results

4.1. Frequency and Production by Date of Birth

We can confirm statistically that birthdates randomly drawn in the Vietnam draft are underrepresented in Major League Baseball. For any date of birth, we count the number of players born on that day. We can then weight each player by productivity, adding up the total number of wins for all players born on a particular day. The first column of panel A in Table 2 shows that the average drafted birthdate provided players with an aggregate productivity of 1.51 wins above replacement. On the other hand, the second column shows that players born on undrafted days produced 2.44 wins above replacement. The third and fourth columns measure the difference between drafted and undrafted days. The third column shows the simple

difference, and the fourth column shows our preferred estimates which use year and month fixed effects to adjust for the changing probability of being drafted over time and potential “mechanical problems” with the draft that may have made the probability of being drafted vary by month. In both cases, birthdates chosen for the draft generate 1 less win than birthdates not chosen for the draft, a very large decrease of 45%.

A significant portion of the decrease in production on drafted birthdates comes from a decrease in the number of players who successfully enter the top league, Major League Baseball. The second row of Table 2 shows that drafted days produce 0.08 fewer major league players than undrafted days. Given that the typical undrafted day only produces 0.42 MLB players, this represents a large decrease of 19%. The measured decrease in MLB players born on drafted days could overestimate the true treatment effect. Major League Baseball teams have a fixed number of roster spots. Thus, drafted players may simply be replaced by undrafted players, increasing the number of players born per day in our control group. If we assume this most extreme case, then we can quantify the extent of this bias. Following the standard potential outcomes framework, define \bar{N}_i^j as the average number of players born to a group of birthdates j which are either drafted or undrafted ($j \in \{D, U\}$). The subscript i then denotes whether the group of birthdates is “treated” by being drafted. Thus, \bar{N}_1^D denotes the observed average number of players born on drafted days, while \bar{N}_0^D denotes the number of players from those birthdates who would have played if they were not drafted. Our goal is to measure the treatment effect of the draft, $\delta = \bar{N}_1^D - \bar{N}_0^D$. As in the standard framework we can only measure the difference between two groups, which can be separated into the treatment effect and selection bias:

$$\bar{N}_1^D - \bar{N}_0^U = \bar{N}_1^D - \bar{N}_0^D + \bar{N}_0^D - \bar{N}_0^U$$

$$\bar{N}_1^D - \bar{N}_0^U = \delta + \bar{N}_0^D - \bar{N}_0^U$$

If we assume the most extreme spillovers, that every player lost from drafted days is replaced by a player from an undrafted day, then $\bar{N}_0^U = (\bar{N}_0^D - \delta * \frac{\text{number of drafted days}}{\text{number of undrafted days}})$. As a result:

$$\bar{N}_1^D - \bar{N}_0^U = \delta + \bar{N}_0^D - (\bar{N}_0^D - \delta * \frac{\text{number of drafted days}}{\text{number of undrafted days}})$$

$$\bar{N}_1^D - \bar{N}_0^U = \delta \left(1 + \frac{510}{952} \right)$$

$$\delta = \frac{(\bar{N}_1^D - \bar{N}_0^U)}{1.54} = \frac{0.08}{1.54} = 0.052$$

Thus, 0.052 represents a lower bound for the true decrease in the number of players born per day on drafted days relative to the number of players who would have played on those days in the absence of the draft. Similar deflation of the measured effects would apply to our results for productivity by birthdate. Still, with 510 drafted days in our data we estimate that 27 players, slightly more than the full roster of one team, would have played in Major League Baseball in the absence of the draft.

4.2. Productivity Conditional on Playing in Major League Baseball

Those players who do make it to MLB despite being born on drafted days are less productive than their undrafted counterparts. Panel B of Table 2 shows drafted versus undrafted comparisons where the sample is now composed of all players who reach Major League Baseball. Players born on drafted days produce an average 4.44 wins above replacement level throughout their careers compared to 5.85 for players born on undrafted days. This difference of about 1.5 wins increases to a 1.7 win difference in our preferred estimates controlling for year and month fixed effects. Again, this effect is very large relative to average productivity. Lower aggregate productivity over the course of a career could be caused either by playing fewer

(above replacement level) seasons or by being less productive each year. The second and third rows of panel B in Table 2 provide these results. Drafted players work for 0.35 fewer seasons, a decrease of 5%. Drafted players produce 0.09 fewer wins per year, a drop of 23%. While both of the measured effects are statistically insignificant, the results suggest that while both may be at play, most of the drop in aggregate productivity comes from productivity per year rather than number of seasons played.

Of course, players observed in Major League Baseball represent only the selected sample of players able to obtain employment at the top of their profession. As demonstrated previously, draft status certainly affected this selection process, and this fact will generate bias in measuring the effect of being drafted on productivity in the selected sample of players. We cannot observe the productivity of players who would have played in MLB if undrafted but who did not ultimately play. However, our combined results point to a complete leftward shift of the productivity distribution for drafted players. In this case, marginal major league players would no longer make it to the major leagues when drafted, and the remaining major league players would be less productive than if not drafted. In this case, selection bias would actually cause us to underestimate the true effect of being drafted on productivity as the unobserved players born on drafted days represent the lower tail of the productivity distribution. Thus, we interpret our results as indicating that the being drafted shifts the entire productivity distribution to the left, causing some players to still play while being less productive and causing others to miss the major leagues entirely.

4.3. Effects across the Productivity Distribution

The reduction in productivity also appears to be concentrated at the top of the productivity distribution. Figure 4 shows the cumulative distribution function of career

productivity for players born on drafted and undrafted birthdates. The two lines mirror each other closely for the bottom 60% of players. Above this point, the blue dashed line corresponding to undrafted days falls below the solid red line corresponding to drafted days. This gap widens particularly among the 10% most productive players, indicating that drafted days are particularly unlikely to produce the very best players. For instance, all of the top ten players by career WAR⁵ were born on undrafted days. We can formalize the effects at the top of the distribution using quantile regression. Table 3 displays the results for a quantile regression of career Wins Above Replacement on a draft status dummy. The first column shows the quantiles we use, the second displays the level of Wins Above Replacement associated with that quantile, and the remaining four columns show the coefficient on the draft status dummy in the relevant quantile regression along with its standard error for quantile regressions without and with year dummies. For instance, the 40th percentile of career Wins Above Replacement is 0.0. Being drafted has a small effect, reducing this quantile by 0.1 WAR. We observe similarly small effects for most of the productivity distribution. On the other hand, the 90th percentile of productivity decreases by 3.0 wins (after controlling for year and month fixed effects) from a level of 17.5 wins. An even stronger decrease of roughly 6-7 wins occurs for the most productive players. Traditional means of identifying the very best players, such as Hall of Fame membership, show similar results. In our sample, 6 out of 951 players born on undrafted dates were voted into the Hall of Fame. On the other hand, zero out of 510 players born on drafted days made the Hall of Fame, making the difference in probability of Hall of Fame membership statistically significant ($p = 0.008$). Estimating effects at the very top of the distribution leads to large standard errors and at times statistical insignificance, so the results should be interpreted

⁵ In order of career WAR: Bert Blyleven, George Brett, Dwight Evans, Buddy Bell, Dave Winfield, Keith Hernandez, Frank Tanana, Cesar Cedeno, Brian Downing, and Fred Lynn.

with some caution. However, these results suggest that within an already select group of stars the draft has its largest effects on superstars.

4.4. Effects by Player Age

The leftward shift in the distribution of productivity caused by being drafted appears to be persistent throughout a player's career. An important question in the literature regards whether the effects of being drafted are persistent or whether drafted individuals eventually catch up. Angrist and Chen (2011) and Angrist et. al. (2011) document that the earnings of drafted men catch up to those of undrafted men by the early 1990s. On the other hand, Siminski (2013) finds evidence that Australian draftees do not catch up with the undrafted. Similarly, those interested in superstar labor markets may wish to know whether workers can recover from early career shocks. We can check whether the effect of being drafted fades for potential superstars. For this analysis, we construct similar frequency counts and aggregate productivity by birthdate but limit each measure to players of a certain age. Then, we can run comparisons between drafted and undrafted birthdates as in Table 2.A, splitting out the effects by player age. Figure 5 shows the results for number of players born per birthdate. The blue line plots the number of players of a certain age born per birthdate for undrafted days. The red line plots similar averages for drafted days. As expected, fewer players are born on drafted days. Perhaps of greater interest, this relationship is true for all ages of players. Figure 6 demonstrates that a similar pattern holds when weighting by productivity. Figure 7 expresses the differences in the number of players and the productivity of those players using the ratio of drafted to undrafted players. This ratio remains below 1 for both frequency and productivity of players, indicating underrepresentation of drafted days. At age 19, drafted days are dramatically underrepresented and particularly so when weighting by productivity. Through the 20s, drafted birthdates catch up

somewhat, achieving 80% of the representation and productivity of undrafted birthdates. However, the catch-up of drafted birthdates stalls prior to total parity. During the latter parts of players' careers (median player age is 27), drafted days become less represented with less productive players. In sum, drafted players are able to make up some ground on undrafted players but never fully close the gap, and drafted players are significantly underrepresented among players with the greatest longevity who play into their late 30s.

4.5. Mechanism: Early Career Disruptions

Why does being drafted lower player productivity, leading to fewer and less productive major players born on drafted days? The data provide several indications that interruptions to vital early career experience in this superstar profession drive the decrease in productivity we observe. The Vietnam draft may interrupt progress in an athletic career either directly through military service or indirectly by incentivizing higher education, which crowds out more applicable on-the-job training in baseball's minor leagues. Card and Lemieux (2001) confirm the popular notion that young men went to college to avoid the draft via educational deferments. In our data, we can observe whether a Major League Baseball player attended college or not (i.e. went directly to minor league baseball). For those attending college, we can observe whether the college is labelled as a junior/community college. Thus, we can measure whether being drafted provided incentives for players to re-arrange their early career experience.

Being drafted generates no gaps in player frequency for those educated at 4-year colleges but large gaps for those with no college or junior college. Panel A of Table 4 display differences in the frequency of players born on drafted versus undrafted birthdates for the three different education groups. Drafted and undrafted birthdates produce similar numbers of players who attended 4-year colleges. Drafted days produce 0.13 college-educated players per day, while

undrafted days produce 0.16 such players. However, even this small and statistically insignificant difference mostly disappears when controlling for year and month fixed effects. Drafted days produce 0.010 fewer players per day, a decrease of only 6% which is statistically insignificant and small. On the other hand, the draft generates a dramatic drop of -0.28 (45%) in the number of players from 2-year colleges and a large though statistically insignificant gap of -0.38 players per day (19%) between drafted and undrafted days for players with no college. The effects on 4-year college and no college players are consistent with various mechanisms driven by the direct effect of military service. Men at 4-year colleges were much less likely to be drafted (Card and Lemieux, 2001); thus, we may observe no effect on those at 4-year colleges and larger negative effects on those not at colleges.

However, the very large gap between drafted and undrafted for players coming from community colleges points to players who endogenously respond to draft incentives by shifting their schooling choices. Draft deferments (type II-A) were also available for those at junior and community colleges. At the time, these deferments would appear less attractive than deferment for attending a 4-year school if the course of the war led to greater conscription in the future. Thus, a potential baseball player might switch away from attending a junior college to a different path that, though suboptimal for developing a baseball career, provided greater protection from the draft. In the end, though, conscription numbers declined rapidly, and in the cohorts that we study men only needed to be in school at age 20 to be effectively shielded from the draft (Card and Lemieux, 2001). Players at community colleges would be unlikely to actually be drafted. Thus, the large decrease in the number of community college players who were born on drafted days cannot be explained by the direct effect of military service. Players appear to have

endogenously altered their early career paths, shifting away from community college to other paths which were sub-optimal for their early career development as baseball players.

We confirm the importance of interrupting early career experience by examining the National Football League (NFL), a similar superstar profession in which the early career training and sorting process differs from Major League Baseball. As has already been seen, professional baseball players may spend their early career training either at formal colleges or they may skip college and begin immediate on-the-job training at minor league teams affiliated with major league clubs. In football, though, all players must be three years removed from high school and thus nearly all players attend college. Given the availability of military service deferments for college, being drafted should not disrupt the early career path of a future NFL player. Panel B of Table 4 confirms that the draft does not restrict potential NFL players. Drafted days produce 0.71 eventual National Football League players per birthdate, while undrafted days produce 0.72. Even the small 0.01 players per days difference disappears (and becomes positive) when controlling for year and month fixed effects. The Vietnam draft did not impede the established early career path of football players playing for amateur college football teams. Without such an early career disruption, players born on drafted and undrafted days are equally represented in the National Football League. This observed parity contrasts with Major League Baseball in which being drafted prevents the natural progression of superstar careers, leading to underrepresentation of those who were drafted.

4.6. Mechanism: Health and Other Direct Effects of Military Service

In addition to this positive case that career interruptions drive at least some of our results, we also find evidence against other mechanisms. Several potential mechanisms are ex-ante plausible. First, being drafted leads to a higher probability of actual military service. Mortality

and injury associated with military service could reasonably lead to fewer players born on draft days. However, if mortality drives lower representation of drafted birthdates in baseball, then men born on draft days should also be under-represented in the general population. Frank (2012) demonstrates that drafted days are not under-represented. This result is not surprising given that the number of casualties in the Vietnam War was small relative to the total population of men born in these cohorts. For instance, the National Archives Vietnam Conflict Extract Data File shows 4,212 casualties for men born between 1950 and 1953. Given the importance of physical fitness for professional athletes, non-fatal physical injuries and disabilities could also explain fewer major league players born on drafted days. However, as documented above we also observe lower productivity conditional on making it the major leagues, which makes such a story less plausible. The physical effects of war seem unable to explain our results.

A variety of other direct effects of military service could more plausibly lead to a shift of the entire distribution of athlete productivity. For instance, post-traumatic stress disorder could plausibly prevent some players from making the Major Leagues while also turning some otherwise superstars into inconsistent or less-productive players. However, the magnitude of the effects that we observe is difficult to reconcile with the direct effects of military service given imperfect compliance with the draft. Angrist, et. al. (2011) reports that because of draft carve outs and the option to volunteer, being drafted only raises the probability of military service by 16 percent, about 1 in 6. As noted above, we find that the number of players born on drafted days is 0.08 lower than an average of 0.42 players per birthdate on undrafted days. Combining these two estimates, a hypothetical draft which raises the probability of military service from 0 to 1 would drop the number of MLB players born on those days by $\frac{0.08}{0.16} \approx 0.50$ from a mean of 0.42. In other words, military service completely eliminates the possibility of playing in Major

League Baseball.⁶ Two reasonable interpretations of this fact seem possible. First, the effect could run through military service itself. In this case the relevant aspect of military service must be universal, affecting each person, or close to it. Career disruptions fit this description better than physical or emotional consequences of war particular to the individual. Second, the effect of being drafted may run through mechanisms other than military service, such as the well-documented tendency to attend college to avoid service. In either case, the effects we observe derive at least partially from career disruptions rather than the direct effects of experiencing war.

5. Conclusion

We study Major League Baseball players subject to the Vietnam War draft lottery and find that being drafted dramatically reduces the probability that a player will succeed in this superstar profession. Drafted birthdates produce 19% fewer major league players. Such early career shocks appear to matter because they make drafted men less productive. Drafted players who do make the major leagues produce 45% fewer wins above replacement over the course of their careers than undrafted players. Productivity per season rather than longevity of career drives most of this gap, and the difference in productivity persists throughout their careers. Drafted players never fully catch up to undrafted players. We also find suggestive evidence that the draft diminishes productivity most dramatically at the very top of the distribution. For instance, all ten of the ten most productive players in our sample were born on undrafted days. Altogether, the data indicates that drafted men were underrepresented among the superstars of Major League Baseball because being drafted led them to be less productive.

The evidence indicates that at least some of the observed effect of the draft on productivity derives from career interruptions more generally, rather than participating in warfare

⁶ Even accounting for the most extreme possible spillovers on the control group (effect of 0.052 instead of 0.07), players per day would drop by 77%.

per se. Unless other forms of career interruption had an effect, the very large decrease in MLB representation we observe is hard to reconcile with the fact that the draft caused a relatively small increase in the probability of military service. Similarly, health effects of war cannot reasonably explain the large effect of draft status on productivity conditional on reaching MLB. Instead, being drafted appears to matter because it disrupted the early career training process either via military service or through draft avoidance behavior such as school attendance. We find two pieces of evidence supporting the notion that school-related interruptions drive at least some of our results. First, we find no evidence of underrepresentation of drafted birthdates in a similar profession, the National Football League, in which nearly all players attend college. Second, we find that the largest decrease in MLB representation among drafted men occurs for attendees of 2-year colleges. In our sample, attending such colleges would have at first only partially shielded players against military service, but ultimately these men were not subject to service after 2 years of school because the draft ended. Thus, we interpret the dramatic underrepresentation of junior college players born on drafted days as an indication of a behavioral response by players. These players shifted away from junior colleges in favor of options with lower draft risk, interrupting the natural progress of their careers and ultimately their chance to make the major leagues. Altogether, we attribute the underrepresentation and reduced productivity of players born on drafted days to career interruptions more generally rather than just military service.

Results measured in professional baseball provide a useful lens into superstar labor markets more generally. While professional baseball clearly presents a unique context, most of the features of the market for baseball players bear similarity to the labor markets for other top income earners. Baseball exhibits the extremes of inflexible early-career structure, low

probability of success, and very high returns to success of superstar and tournament labor markets. Our results then provide insight into the implications of such labor market features. Rigid structure of early career experience may exist because such rigidity does in fact lead to quick accumulation of human capital and efficient sorting of ability. Thus, heavy labor market penalties for career interruptions may simply reflect the penalty on productivity that such interruptions entail. On the other hand, if superstar labor markets heavily and permanently penalize workers for temporary shocks, then membership among the very top end of the income distribution will itself be heavily dependent on random early career events including not only conscription but also childbirth and early career labor market conditions. These dueling realities present problems for public policy. For instance, Goldin (2014) argues that the “last chapter” in gaining equity between men and women should involve greater flexibility in working hours. While such changes may enhance equity in some fields without a commensurate loss of efficiency, the present results suggest that implementing greater flexibility in superstar labor markets may result in a classic tradeoff between efficiency and equity. More generally, our results point to a false dichotomy in the current debate on the increasing share of income going to the top 1% of income earners. Observers tend to explain top incomes as reflecting either productivity or luck in being at the top of the pyramid at the right time. However, very high incomes may simultaneously reflect both an individual’s productivity and a highly contingent process in which one’s position at the top of the income distribution depends heavily on random shocks experienced early in life. We square these two observations by demonstrating that early career interruptions can dramatically reduce the productivity of superstars.

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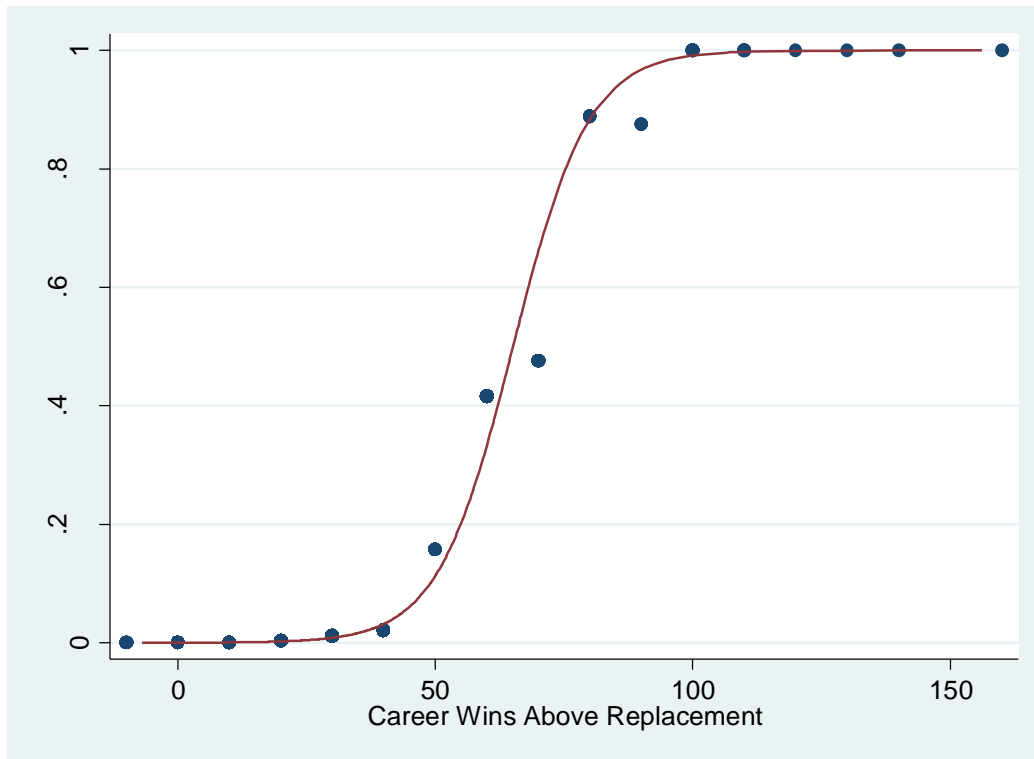
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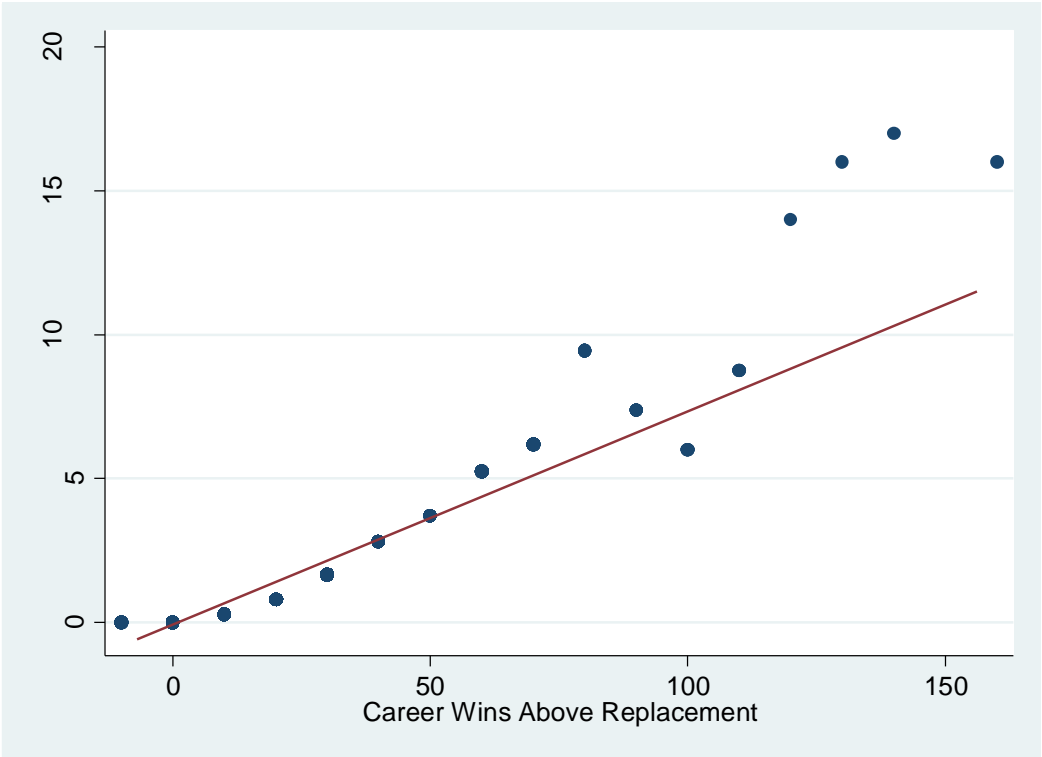
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Figure 1: Wins Above Replacement and Hall of Fame Membership



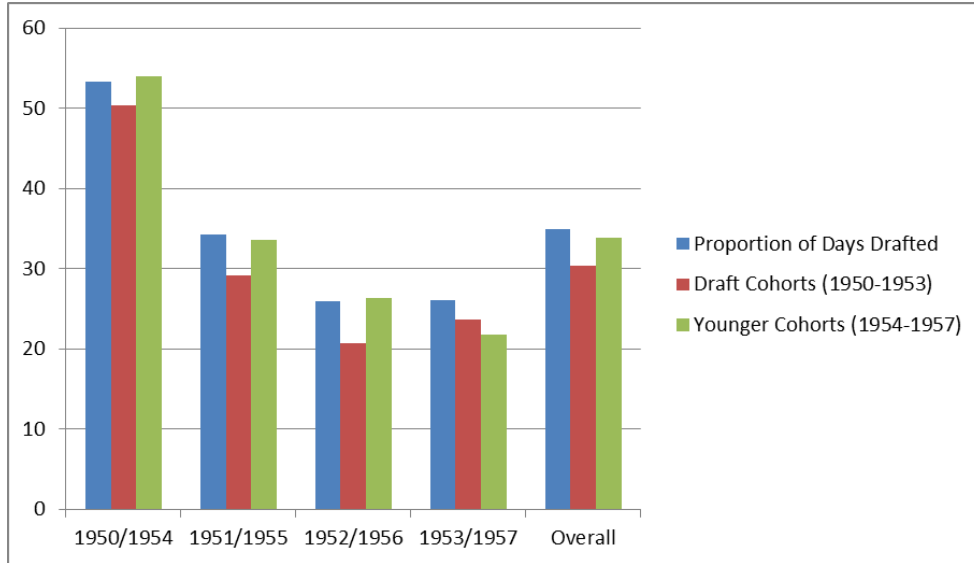
Plotted points show the fraction of players in the Hall of Fame. Each point represents the fraction for a group of players with career Wins Above Replacement in the same 10-win bin. The curve shows the fitted values of a logistic regression of Hall of Fame membership on career WAR. The figure includes all Major League Baseball players born after 1914 and finishing their careers by 2000. This sample thus excludes earlier players for whom there was no All-Star game and recent players who have not yet exhausted eligibility to be voted into the Baseball Hall of Fame.

Figure 2: Wins Above Replacement and All-Star Game Appearances



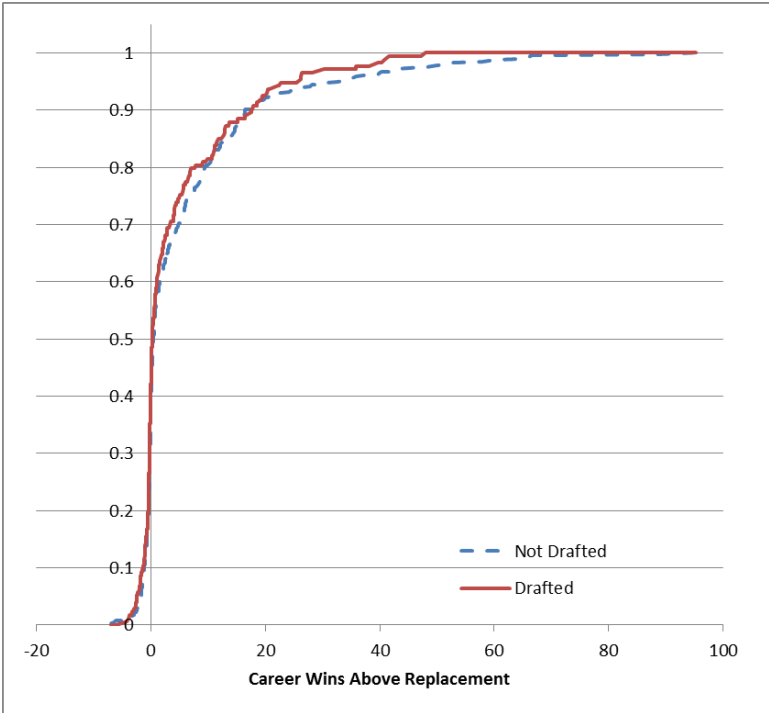
Each point shows the average number of All-Star game appearances for the group of players with career Wins Above Replacement in the same 10-win bin. The curve shows the results of a linear regression of number of All-Star appearances on career WAR. The figure includes all Major League Baseball players born after 1914 and finishing their careers by 2000. This sample thus excludes earlier players for whom there was no All-Star game and recent players who have not yet exhausted eligibility to be voted into the Baseball Hall of Fame.

Figure 3: % of Players Born on Drafted Birthdates, By Birth Year



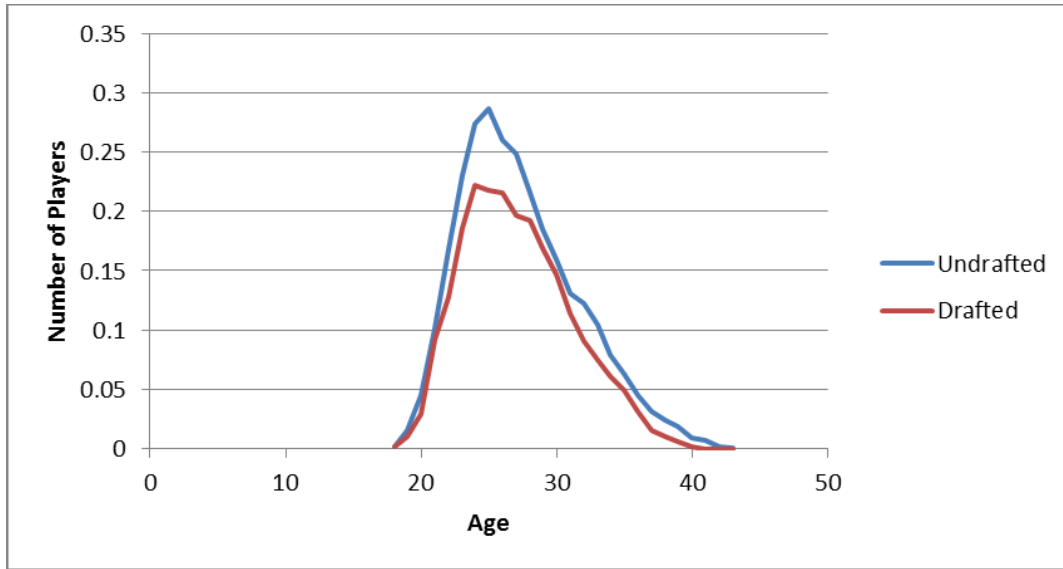
Each bar displays the percentage of the relevant outcome variable corresponding to days drafted for service in the Vietnam War draft. Blue bars are a simple count of the number of birthdays called for the draft, while red bars count percentages of MLB players born on those days during the draft years of 1950-1953 and green bars count MLB players born on those same days in later years when the draft was not in effect.

Figure 4: Distribution of Career Productivity, C.D.F. by Draft Status



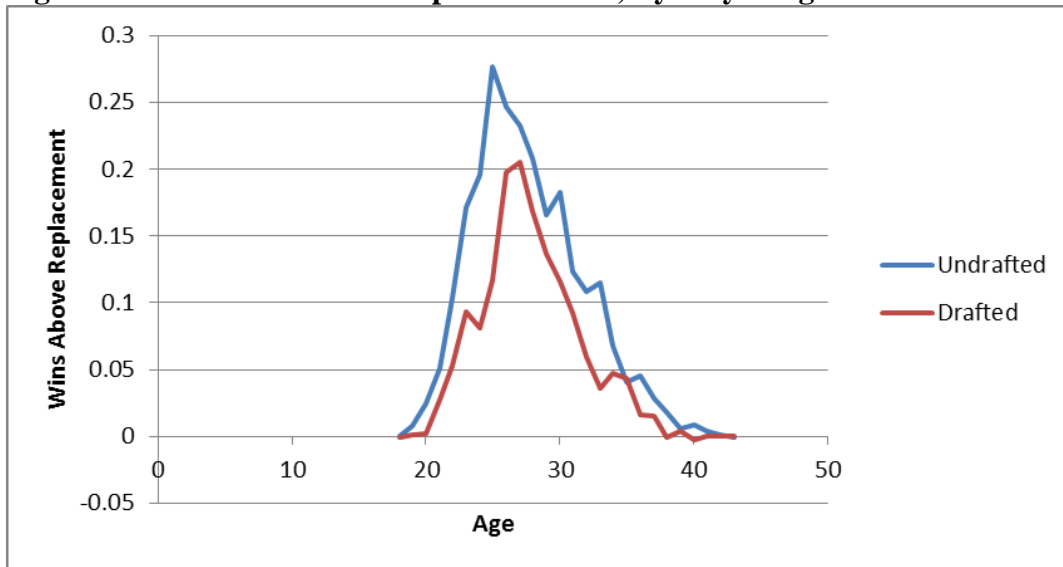
Cumulative distribution function of career wins above replacement produced for the sample of Major League Baseball Players born between 1950 and 1953, split by draft status.

Figure 5: Effect on Number of Players per Birthdate, By Player Age



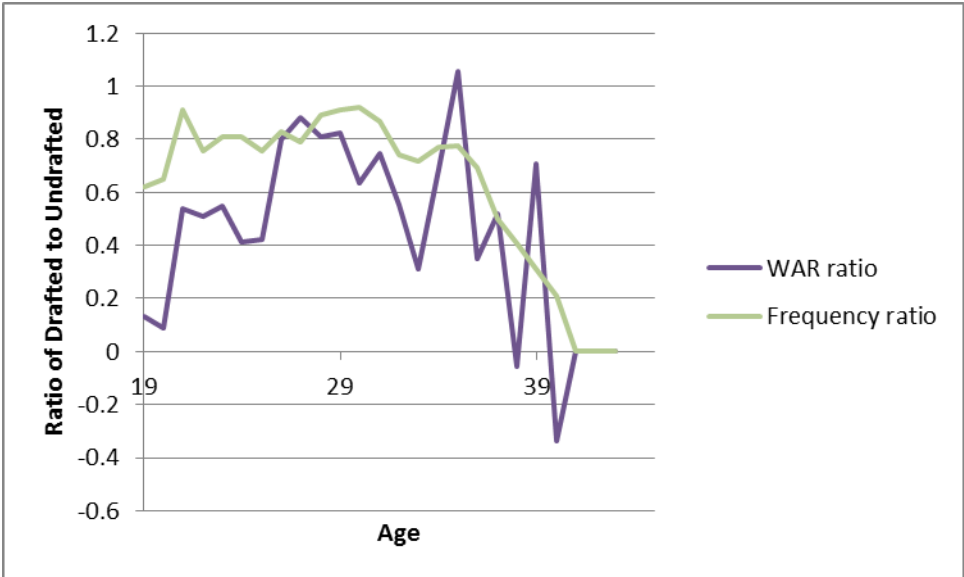
The blue line shows simple counts of the number of major league seasons played by players of a given age who were born on undrafted days divided by the number of such days. Similar for the red line and drafted days.

Figure 6: Effect on Production per Birthdate, By Player Age



The blue line shows total career wins above replacement for major league seasons played by players of a given age who were born on undrafted days divided by the number of such days. Similar for the red line and drafted days.

Figure 7: Ratio of Drafted to Undrafted, Productivity and Frequency by Player Age



Shows the ratio of drafted to undrafted number of players and productivity using data from figures 3 and 4. The picture has been trimmed at age 18 because of the very small number of players age 18 or below.

Table 1. Tournament Structure of Professional Athletics versus Finance

Baseball Players (Born in 1952)			Goldman Sachs Employees (Current)		
	Number	Pct.		Number	Pct.
Multiple-Year All-Stars	5	0.5%	Executive Officers	10	0.03%
All-Stars	16	1.7%	Partners	467	1.4%
Major League Players	146	15.7%	Total Employees	32,400	100.0%
First-Year Player Draft	929	100.0%			

Baseball Players (current)		Goldman Sachs Employees (Current)	
	Pay		Pay
Maximum	\$33 million	Chief Executive	Up to \$68 million \$900,000 + bonuses (millions of \$)
Avg. Major League Player	\$3.3 million	Partners	
Upper Level Minor League Player	\$32,500 to \$125,000	Entry Level	approx. \$100,000
Lower Level Minor League Player	\$3,000 to \$7,500		

Data on MLB players, salaries, and all-star appearances are from the Lahman Baseball Database. First-year player draft numbers are from Baseball-Reference.com. Minor league salary information is from McCann (2014) and Broshuis (2010). Goldman Sachs number of executive officers is from its website, accessed 2/25/2015. Number of partners is from Lorenzetti (2014) and number of employees is from Stock (2014). Information on Goldman Sachs compensation is from Roose and Craig (2012).

Table 2. Frequency and Productivity by Draft Status

	Drafted	Not Drafted	Difference	Difference with Year and Month FE
A. Sample: Dates of Birth				
Career Wins Above Replacement	1.51	2.44	-0.93** (0.41)	-1.09*** (0.41)
Number of Players	0.34	0.42	-0.08** (0.03)	-0.08** (0.03)
N	510	951		
B. Sample: Players (Conditional on Playing in MLB)				
Career Wins Above Replacement	4.44	5.85	-1.41 (0.97)	-1.72* (0.96)
Years Played	6.66	6.82	-0.16 (0.45)	-0.35 (0.46)
Wins per Year	0.33	0.39	-0.06 (0.07)	-0.09 (0.07)
Debut Date	24-Feb-75	21-Aug-75	-178** (82)	34 (72)
N	173	396		

Statistical significance at the 1, 5, and 10 percent levels is denoted by ***, **, and * respectively.

Robust standard errors are in parentheses. The first two columns display means while the latter two columns report the coefficient on a draft eligibility dummy from a linear regression with the outcome defined as the variable in the left column. The unit of observation in panel A is a birthdate while the unit of observation in panel B is the player.

Table 3. Effect of Being Drafted across the Productivity Distribution

Quantile	Percentile WAR	No Year FE		Year and Month FE	
		Coeff.	SE	Coeff.	SE
10	-1.2	-0.1	(0.3)	-0.4	(0.3)
20	-0.5	-0.0	(0.2)	-0.0	(0.2)
30	-0.2	-0.1	(0.1)	-0.0	(0.1)
40	0.0	-0.1	(0.1)	-0.1	(0.2)
50	0.4	-0.3	(0.4)	-0.1	(0.5)
60	1.3	-0.5	(0.9)	-0.6	(1.0)
70	4.3	-1.5	(1.6)	-1.7	(1.4)
80	9.3	-1.7	(2.3)	-3.5	(2.3)
90	17.5	1.1	(4.0)	-3.0	(5.0)
95	28.2	-8.4	(9.4)	-7.5	(10.6)
99	60.1	-24.3	(17.3)	-6.6***	(0.4)

Statistical significance at the 1, 5, and 10 percent levels is denoted by ***, **, and * respectively. Standard errors are in parentheses. All quantile regressions use the sample of players who make it to the major leagues. Each row corresponds to a particular quantile listing the number of the quantile, the unconditional percentile of wins above replacement in the data, and coefficients and standard errors from two separate quantile regressions.

Table 4. Number of Players by Birthdate, by Education and Sport

A. By Level of Education	Drafted	Not Drafted	Difference	Difference with Year and Month FE
4-Year College	0.13	0.16	-0.022 (0.021)	-0.010 (0.021)
Junior/Community College	0.03	0.06	-0.035*** (0.011)	-0.028** (0.011)
No College	0.18	0.20	-0.020 (0.024)	-0.038 (0.025)
B. By Sport				
All Major League Baseball Players	0.34	0.42	-0.077** (0.034)	-0.076** (0.035)
All National Football League Players	0.71	0.72	-0.009 (0.048)	0.010 (0.049)
N	510	951		

Statistical significance at the 1, 5, and 10 percent levels is denoted by ***, **, and * respectively.

Robust standard errors are in parentheses. The first two columns display means while the latter two columns report the coefficient on a draft eligibility dummy from a linear regression with the outcome defined as the variable in the left column.